Railway Maintenance Engineer

Volume 16 February, 1920 Number 2

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering* and *Maintenance of Way*.)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
Transportation Building, Chicago, Ill.

New York: Woolworth Bldg. Clevelands Citizens' Bldg.
Washington: Home Life Bldg. Cincinnati: 1st National Bank Bldg.
London: 34 Victoria St., Westminster, S. W. 1.
Cable Address—Urasigmec.

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Entered at the Post Office at Chicago, Ill., as mail matter of the second class.
Subscription price, $2.00; foreign countries, $2.50.

WE GUARANTEE, that of this issue 8,200 copies were printed; that of these 8,200 copies, 7,580 were mailed to regular paid subscribers, 52 were mailed to advertisers, 25 were mailed to employees and correspondents and 543 were provided for new subscriptions, samples, copies lost in the mail and office use; that the toal copies printed this year to date were 16,500, an average of 8,250 copies a month.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

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Whether economical or not, the winter is a season of reduced forces in practically all branches of maintenance of way work. Since the gangs are in general cut down to the bare necessities, the tendency is to do only the most pressing work. The result frequently is that foremen do not take the opportunity to do such constructive work as time and weather conditions permit. There is much work which gangs in all branches of maintenance service can do in time which would otherwise be lost, but which when done, leaves that much less for the busier summer season. By watching their opportunities, foremen can get a surprisingly large amount of work out of the way during the winter. Supervisory officers can well afford to go over such work with their foremen and emphasize the importance of keeping it in mind. Properly followed, this will go far towards reducing the peak load next season and thereby aid in solving the expected labor shortage.

Reducing Next Summer's Labor Shortage

One interesting fact brought out in discussing the methods of bridge inspection at the last convention of the American Railway Bridge and Building Association was the lack of uniformity in the conduct of these inspections, particularly as to the character of the reports made and the forms used in making and preparing the reports. This has led to the assignment of a new subject in the work of this association for the coming year in that one committee has been instructed to prepare standard forms for bridge inspections. Railway bridges and trestles are much of the same type the country over and considerable progress has been made in the adoption of standard specifications and methods of design for steel, concrete and timber bridges largely through the activities of the American Railway Engineering Association. Surely there can be no good reason why there should be as many different forms for preparing inspection reports as there are railroads. Some diversity in such forms has resulted from variations in the organization of maintenance of way work on different roads. It is also warranted in part by differences of opinion as to the type of man to be selected for positions as inspectors. However, most of these differences ought to be ironed out and there would seem to be an opportunity for this committee of the Bridge and Building Association to do a real constructive work in preparing a form for inspections that could be adopted with perhaps minor modifications by most of the railroads.

Bridge Inspection Reports

The story entitled "Cleaning Up Section Six" deserves careful reading by every maintenance of way man. While it refers specifically to track work, its lesson is equally applicable to other branches of maintenance work. Nearly every supervisor can identify Jim Tyler among his foremen, an excellent workman in those things which he undertakes, but careless as to minor details. He may have the best riding track on the section, but it is not

Neatness An Aid to Efficiency

well kept and presents a run-down appearance. His attitude is well expressed in his statement that "no one ought to expect one to keep a section like a parlor." Yet it is for more than sentiment or a mere hobby that importance is attached to the maintenance of a clean roadway. Not only does a well policed right-of-way constitute an advertising asset which is reflected in good will and increased business from those traveling over the road, but there are even more direct returns in the value of the scrap picked up promptly. Still more important is the effect on the men themselves. Carelessness reflected in such details as neglect to keep the right-of-way cleaned up does not stop there, but is carried to other details of work, such as the tightening bolts, the protection of tools, the maintenance of the motor car, etc., for a man who is careless in one detail of his work will be careless in all. On the other hand, attention to these details is likewise reflected through one's entire work with the result that the systematic foreman will get much work done which a careless man will not find time to do. System is the basis of success in track work as well as elsewhere and the man who is careless has lost this first essential. It is to be hoped that many of those readers who are inclined to agree with Jim Tyler in his original thought—that one cannot expect a man to keep a section like a parlor—will see the lesson which this story presents for them and that they may earn a reward for this new vision as he did.

LEGISLATION AND THE SEASON'S WORK

ALTHOUGH WE are separated by only one month from the date fixed by the President late in December for the return of the roads to their owners, their future is still as uncertain as it was 30 days ago. It is true that the conferees of the Senate and the House have agreed on some points, but these are the less important ones and some wide differences remain to be reconciled on the main points of divergence between the Cummins and Esch bills. The inevitable result is that while the managements are perfecting their organizations preparatory to taking their properties back, they lack the confidence which would enable them to prepare properly for the extensive programs of improvement work which the roads require.

The effect of this delay on the maintenance of way department is evident. Routine maintenance work, which is paid for out of current operating revenues, is entirely under the supervision of this branch of the service, as is also a large part of the improvement work for which new money must be raised. Plans for the routine maintenance work are proceeding in large measure according to the normal schedule. Rails are now being ordered in large quantities, as are other supplies necessary for current repairs and renewals. Yet even here the present uncertainty is exerting marked effect. Not only have the roads delayed placing their orders for rails until the last few weeks, with the result that they will not be able to secure complete deliveries until well into the summer, but the general uncertainty regarding the entire future of the roads has led to the almost complete cessation in the production of ties. The maintenance program for the coming year will, therefore, be subjected to many interruptions from one cause or another.

The situation is far more serious in retarding the improvement program. The roads have not made the normal improvements during the last four years. Largely as a result of this they are today unable to handle the traffic offered to them even when operated as one unified system with the maximum of capacity. Yet in the face of this absolute shortage of facilities they are unable to proceed with the completion of plans, the ordering of materials and the organization of forces for even a normal season's work in 1920. Each day's delay in perfecting legislation of the proper character is serving further to retard the improvement work, with the result that when such legislation is passed the roads will come into the market for such large quantities of labor and materials that they will be unable to secure their full requirements in either, leading to still more delay in completing those improvements so urgently demanded.

The maintenance of way department is, therefore, in a state of uncertainty in which it cannot do its best work. It is to be hoped that the next few weeks will see the completion of the legislation on a satisfactory basis so that definite schedules can be prepared and work prosecuted at a rapid rate. In the meantime, maintenance of way officers should carry to completion the preparation of plans for such work as can reasonably be done this year and arrange all preliminary details so that they may be as fully prepared as possible for any developments that may occur.

AN EXPERIMENT IN INDUSTRIAL DEMOCRACY

THE PEOPLE of the United States will soon have an opportunity to observe the operation of at least one experiment in co-operative control of industries and it is a matter of particular interest to the employees and officers of the maintenance of way departments of the railroads, that the initial step in this direction has been taken by the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers as described on another page of this issue. The motive of this undertaking may be described as an endeavor to demonstrate that organized labor may improve the economic position of its members in other ways than by perpetuating the "vicious circle" of increasing prices. In common with a great part of the people in this country, it believes that there is too great a disparity between the cost of manufactured article and the price at which it is sold to the consumer. The middleman, who is blamed for this disproportionate margin, is to be eliminated by a direct contact between the producer and the consumer.

Possibly the prime factor which would lead anyone to question the success of this venture is that the rank and file of the organizations will expect too much of their officers in reducing the cost of the articles they are to manufacture and sell. This is a fundamental phenomenon of psychology that affects all co-operative organizations. Thus, differences of opinion are constantly arising in the fraternal insurance companies because the officers are unable to reduce the rates to a point that is satisfactory to the members who are not in a position to appreciate how much the insurance is actually costing. In the same way members of the maintenance brotherhood will probably look with discredit at any allowances made in the cost of articles for plant depreciation, sinking fund for renewals, cost of distribution, overhead, etc.

Information given out thus far with regard to the management of these industries does not make it clear as to just what extent the employees will participate in their control. One point is set out very emphatically—that the shops will all be conducted under union labor principles, but just what would transpire in case of any controversy between the union factory hands and the representatives of their employers (the union railroad men), must be left to conjecture. At any rate, it must be conceded that the general scheme of management as constituted does not provide the incentive for economy and efficiency all along the line that prevails in an establishment conducted by an owner who is in the business solely for profit. The question then concerns the relation which this profit of the manufacturer, plus that of the middleman and the retailer,

will bear to the increased costs to be incurred in a project undertaken without any desire for profit, but under a plan that discourages efficiency. In view of the fact that labor, not only in the employment of the railroads, but in other industries, is determined to make this experiment, it may as well be made now as at some time in the future.

RAILS AND TIES

IN LAST month's issue data were presented to show the situation with respect to ties and rails at the end of two years of government control. The conditions cannot be said to have been entirely satisfactory, but the deficiency in rail and tie renewals, considered in connection with the stocks on hand, present a more favorable aspect than was inferred from such information as was available before these figures were given out.

The problem now confronting the railroads implies the undertaking of such measures as will insure the return of the roads on March 1 in a condition equal to that which prevailed on January 1, and with arrangements so perfected as to insure the delivery of rails and ties in adequate quantities as rapidly as they can be used during the course of the ensuing working season. From reports available it would appear that the roads are now arranging for upward of 1,000,000 tons of rails, a considerable portion of which has actually been ordered. Just how soon and at what rate the mills will be able to deliver this tonnage cannot now be estimated with any reasonable degree of accuracy.

In the case of ties, the aspect is less favorable. After two years of arduous effort a favorable rate of production has been secured with machinery for the purchase and distribution of cross-ties entirely different from the trade customs in this industry prior to government control. Because of the disruption of existing arrangements which this new system brought about, together with the disturbances caused by war conditions, production on the new basis was not built up to a satisfactory condition until during the past year and now with the end of government control established, this new system of handling ties will go out of existence on March 1. After that date, presumably, the railroads will purchase ties according to arrangements that have prevailed until January 1, 1918, but unfortunately no plans have been made to insure the continuation of tie production until March 1. The purchasing department of the Railroad Administration has no authority to purchase ties for the corporate managements and the latter have not commenced to function effectively.

Moreover, the question of price is also uncertain. The producers do not know what prices will prevail at the end of government control, so neither they nor the contractors are inclined to take the initiative in production until they can make some estimate as to what the ties will bring after March 1.

The question of specifications is also a subject of uncertainty, for although a large number of those interested have favored the Railroad Administration's specifications, no one seems to know whether they are to become the standard specifications of the American Railroad Association or not. This leaves the producers at a loss to know whether to produce ties conforming to the government specification or those of the railroads which afforded an outlet for ties in their territories previous to the advent of government control.

As a consequence of these conditions, the production of cross ties is now falling off very rapidly and unless something is done to place the tie market on a firm basis very quickly, the railroads will be confronted with a very limited supply and a very low rate of production when they go into the market on March 1.

LETTERS TO THE EDITOR

SAND BLASTING VS. CHIPPING

Chicago, Ill.

TO THE EDITOR:

I have read with much interest the report on the painting of metal railway structures, including Appendix A, entitled "Protection of Metal Structures," presented before the American Railway Bridge and Building Association, published in the November issue of the *Railway Maintenance Engineer*, and note that 17 of the roads from which reports were received use scrapers, wire brushes, chisels, etc., to clean bridges, owing to their being much cheaper than the sand blast. I have personally watched the painting of a large railway viaduct crossing a boulevard in this city and took special notice of the surface of this structure after it was supposed to have been thoroughly cleaned. There were dozens of places, especially around the rivet heads, where spots of rust had been left, ranging in size from that of a pea to as large as a 25-cent piece, and this surface was painted by the painters in applying their first coat. If the spots of rust are left on the iron they will invariably begin to eat farther into the structure similar to a cancerous growth. To make a long story short, although the sand blast may be more expensive, it is cheaper in the end than the chipping process, as, no matter how closely a job may be watched, I have never yet seen a surface that was made perfectly clean by chipping and brushing.

The use of red lead was favored in the report mentioned. Although red lead is a very good pigment, it has a tendency to disintegrate when brought in contact with sulphurous gases, and a railroad bridge is certainly subjected to these fumes, especially the upper structure. It will also check when exposed to the air, due to excessive oxidation. My personal belief is that a mixture of zinc yellow (chromate), neutral willow charcoal and iron oxide (the latter is optional) would be a much better combination. In regard to the reinforcing of linseed oil with Japan oil, my experience has been that when an addition or reinforcing of this kind is made, the drying is forced too much and the film will become tight, not unlike a stretched drumhead, and thereby lose a large percentage of its elasticity, which is so important to the long life of the paint. Where the addition of a dryer is necessary, a pure turpentine manganese dryer should be used in the proportion of 6 to 10 per cent, depending upon the climatic conditions.

W. A. OTLEY.
Secretary, Otley Paint Manufacturing Company.

MOUNTAIN OR COAST FIRS—Various users of Douglas fir ties have been of the opinion that the fir from the Rocky mountains was more durable than that grown on the Pacific coast. While there are no authentic records available to date as to the relative durability of mountain grown and coast grown ties placed in service in the same locality, the Forest Products Laboratory states that such service records as there are fail to show any appreciable difference between the two varieties. On the average, Pacific Coast fir is somewhat stronger and harder than mountain fir due to its greater density. This slight difference is equalized by the fact that ties made from coast timber are usually cut from the tops of trees, the boxed hearts or from wood near the pith. As these are the poorer parts, there is little difference in the ties from either class of wood.

CLEANING UP ON SECTION 6

By J. E. A.

MOLLY TYLER stood in the doorway of her little bungalow and peered long and anxiously across the meadows at the distant tool house. Fully 30 min. had elapsed since she had seen her husband, Jim, with his gang arrive on their motor car, unload their tools and dinner pails and run the car into the house.

The four men who comprised the gang had lost no time in leaving the tool house at the conclusion of this task, and Molly, according to her usual custom, had made the final preparations for supper, so that when Jim got home everything would be ready, but tonight Jim did not come. Molly knew he was all right, for she had seen him help lift the car off the track and head it into the section house. She had noted how each man had looked back as he left it as if saying good-night to Jim. But there were the doors, wide open, and no sign of Jim.

Molly was a devoted wife and mother, but her patience was sometimes sorely tried by her big husband, who had one or two aggravating traits of character that she had thus far failed to prevail on him to overcome. One of these, and perhaps the greatest, was procrastination, and as she waited for him tonight her patience gave way to a stronger feeling, that of anger. "I'll fix him," she breathed through tightly pursed lips, "I'll teach him something that he won't forget when he does get here."

With another look at the tool house doors she turned away to pick up Jimmy, Jr., aged two, who was crying lustily for his supper. As she was about to feed him a form darkened the door. Molly stared at the newcomer in astonishment, for it was Tony Raffelo, a young Italian and one of Jim's gang. Instinctively Molly scented trouble. Something had happened to bring Tony here at that hour and his face plainly corroborated her suspicions, for he was the picture of unhappiness.

Molly was not one to mince words when her curiosity was aroused. "What is it, Tony?" she asked sharply. "What has happened? Where's Jim?" But Tony only shifted his eyes from her to Jimmy, Jr., who was holding up his hand expectantly for the sweets Tony usually brought with him. Quickly walking up to Tony, Mollie shook him by the arm roughly. "Come, speak out," she commanded in a voice that had an immediate effect on the embarrassed Italian. Pointing to a newspaper that lay on the table he said, excitedly, "No good, pape no good, dat make all de troub."

When excited Tony's English was considerably less intelligible than in his calmer moods and it took some time for Molly to learn from him that Jim had taken his gang to Carlton Junction that day and there had met Hank O'Day, the foreman of the adjoining section, and had been completely knocked out after reading a newspaper clipping which Hank had given him; so much so, in fact, that he had scarcely touched his well-filled dinner pail, had taken no interest whatever in his work and frequently had failed to answer when any of his men ventured to speak to him.

Molly did not delay action, once she fully comprehended the situation. Putting the steaming victuals away, she hastily picked up Jimmy, Jr., who seemed to know something unusual was up, and, turning to Tony, she said, "You had better go now, I am going after Jim. Thanks for telling me."

As he left the house Tony turned and put his fingers to his lips in mute appeal for Mollie not to tell Jim that he had stopped to talk with her. She nodded to him and, without a word, started down the path that led to the tool house. As she neared the open doors she cautioned Jimmy, Jr., not to make a sound. Noiselessly she approached the doors, paused outside a moment and then suddenly stepped in.

The motor car had been run to the far end of the house and on the end of the car, his legs crossed, his head bowed upon his breast, sat Jim. In one hand he held a crumpled piece of newspaper which did not escape Molly's eye, while in the other he grasped his pipe, his never failing companion when anything perturbed him. Tonight, however, it had failed in its mission. So deep in reverie was he that it was not until Jim, Jr., had scrambled out of his mother's arms that he raised his head and met Molly's gaze.

"Well," began his irate spouse, noting Jim's clumsy attempt to conceal the paper in his hand, "I want to know now, Jim Tyler, what you mean by treating your wife and baby in this shameful manner. You have been here over an hour, while Jimmy and I have been waiting for you with supper all ready, and here you have been sitting in this dirty old tool house without a thought of your home and family."

Here she paused for a moment and then, catching sight of the crumpled paper partially concealed in Jim's

hand, she stepped forward with outstretched hand: "Give me that paper," she commanded.

Jim drew back the hand that held the paper. "Give it to me, do you hear?" Mollie repeated and, reluctantly, Jim handed her the clipping without looking up. Smoothing it out as best she could, Molly went to the doorway to read it in the failing light. Holding it up where she could see it best she read the headlines: "S. T. & P. R. R. Awards Prizes For Best Kept Sections." She caught her breath, paused and looked in at Jim. It was all clear now. With an effort this time, she again held the paper up to the light and read the following: "In accordance with the policy of the S. T. & P. R. R. Co., formulated last year, to award prizes to the foremen having the best kept sections, the company recently completed a trip of inspection over the system with this end in view, and acting on the report made by the inspectors, has just announced the names of the successful foremen." Molly read this far and stopped. For a few minutes she stood motionless with her eyes wide and staring into space.

Then, suddenly coming to herself, her eyes again sought the paper. Rapidly she ran down the list of prize winners until she came to the River division, the one on which Jim's section was located, and read: "George Lambert—$100." All excitement now, she turned her blazing eyes on her husband, who was still sitting round shouldered on the motor car, and said: "No wonder you were ashamed to come home. I don't blame you. I'm ashamed for you, Jim Tyler!" Her voice was low but tense with anger, and the dejected attitude of her husband seemed to exasperate her almost beyond endurance. Stamping her foot, she said: "Jim Tyler, look at me!" Slowly he lifted his eyes and they were full of tears. Whatever else was in Molly's mind at that moment remained unsaid. Jim in tears was a sight she had never seen before and instantly all the bitterness that a moment before had been struggling for expression, left her heart. She had oftentimes made him writhe with agony of soul with her sharp tongue and at times he had heeded it, but she had never seen him like this. Jim was careless in his habits. That was his worst fault. In fact, that was the only reason that he had failed to win the prize for the best kept section. Molly could see that. She knew, too, that her husband was the best track man on the River division and everybody else knew it. Time and again she had heard the roadmaster compliment Jim on his section and hadn't he frequently sent men to Jim for instruction on track maintenance?

It had always been a matter of pride with Molly to know that her Jim excelled in his work and it was her ambition in life to see him advance. When the S. T. & P. R. R. during the previous year had anonunced that in the future it would give a prize of $100 to the foreman on each division who had the best kept section Molly had simply figured that the hundred awarded to the River division was coming to Jim. Never for a moment had it occurred to her that anyone else had a look-in. She had made all her plans on how that money, added to what they would be able to save in the meantime, would clean up the last indebtedness on the little bungalow.

As for Jim, he was sure of winning. He feared no competitor on the division. In fact, most of the foremen had served under him and he knew he could still give them all lessons on track work. So to him it was all settled except the formality of receiving the hundred.

Jim remembered the day the inspection was made; how the judges had complimented him on his exceptionally smooth riding track. True, they had mentioned something about appearances, calling his attention to certain untidy points along the right-of-way that ought to have been cleaned up, but Jim had not worried about that. When it came to what really counted in track maintenance he was satisfied that he had the banner section. He knew that there was not a low joint or a bad tie in the three miles of his section, not a spike was missing where a spike ought to be and that every curve was perfect. Jim knew all about curve elevation and how to line curves to carry a train like a piece of straight track. In short, awarding that hundred to anybody else seemed impossible to both him and Molly. No wonder, then, that the news of the award was overwhelming.

Not only was it the worst blow he had ever received, but knowing as he did how Molly had planned on the prize, and realizing her bitter humiliation on learning the truth, for she had made no secret of her expectations among her friends, his own crushing sense of defeat and the prospect of a storm when he got home were too much for him. Her wrath, the things she would say, her wounded pride, were all clearly visualized and it was more than he cared to face tonight when he was already deeply humiliated over the matter.

Looking at him from the doorway it all came to Molly in an instant. She understood fully his every thought and action that day just as clearly as if she had been with him and a feeling of pity stole over her. "Let's go home, Jim," she said softly, and hastily picking up little Jimmy Jr. she stepped outside, while Jim in silence shut and locked the doors. Together they started up the path toward home.

That night after little Jimmy had been put to bed Molly drew a chair up alongside of Jim. With his clipping in her hand she said: "It's no use crying over spilled milk. We lost the prize fair and square enough. I can see it all now. Did you read it all?" she asked, holding up the paper. He nodded. "Then you know," she went on, "why we lost. You realize, don't you, that it really pays to keep things picked up, as I have always told you?" Jim shifted uneasily on his chair. "It ain't right, Molly," he said, "nothin' right about it. What difference does it make if the grass ain't cut just the same length all over the section? Supposin' there is somethin' or other layin' round that ought to be picked up. No one ought to expect me to keep a section like you keep your parlor," he stoutly asserted.

"Listen to me, Jim," said Molly. "Just as long as you look at it in that way, just so long George Lambert will win the prizes you ought to have and can get for the taking. Listen while I read out loud the conclusion of the report on which the award was based." Molly held the paper so Jim could follow her and read: "In the distribution of prizes the judges felt that it was only justice to take into consideration the appearance of each section as well as the condition of the roadbed and the track. It is being recognized constantly that a clean, tidy appearance of the entire right-of-way is one of the best advertisements a road can have. Often attractive surroundings are more thoroughly enjoyed and commented upon than comfortable riding track. From time to time the company has endeavored to impress on the minds of all concerned the importance of keeping scrap picked up, ties and rails neatly piled, fences repaired, cattle guards and crossings in first class condition, flower gardens around depots carefully looked after, tool houses kept in order, with all tools and supplies taken care of in proper manner. In spite of this some of the best section foremen have ignored the instructions entirely, while other men less competent in maintenance of roadbed have excelled in keeping their sections in order. In making the awards the efforts of the men to maintain a higher standard of appearances have been recognized and it is hoped that another year will see a great improvement along these lines by those who failed this year to be considered in the awards."

Molly laid down the clipping. "You might as well give in, Jim," she said; "we lost the prize this year because of your natural born carelessness. Next year it's going to be a different story," she went on decisively, "for I am going to take a hand in winning that prize myself." And Molly carefully laid away the clipping for future reference.

Nothing was said about the subject in the Tyler home for many weeks. Whatever Molly had planned in her own mind about her campaign when spring should come again she kept to herself, and Jim never alluded to the matter during the winter that followed, and it was not until after the last snow bank had melted away and the robins were a common sight around the Tyler bungalow that Molly again began to display interest in track work.

"Jim," she said one morning as he was about to leave the house, "what are you going to do today?" "Why?" he asked as he picked up Jimmy Jr. and kissed him good-bye. "Well," said Molly, "there are some things on your section that need doing right now that have apparently escaped your attention. Some people can't see anything with a microscope even after they have had a bad fall over it. None so blind as those who won't see," she continued sarcastically, noting Jim's crestfallen appearance with a good deal of satisfaction. "You might as well get your eyes open now as later," she went on savagely. She knew just how to stir Jim to action and on the present occasion his flushed face and tightly closed lips showed her clearly that her words had struck home.

"What needs doin', Molly?" he asked in a low voice.

"Well, there was a wreck last winter just below your tool house and the cars were so badly smashed up that some of them were burned right where the wreck was. I can see without leaving the house that you haven't cleaned up that place yet. There's a big black spot all covered with ashes and bits of unburned debris beside the track that I imagine looks mighty bad from the windows of passenger trains. Passengers can't help seeing it if they look out and to see it is to remind them of wrecks, because anyone would know well enough what had happened there by the present appearance. Naturally people don't like to be reminded of things like that when traveling.

"Furthermore, little Jimmy and I went down to your tool house the other day and I took your extra key along and we went in. Such a place I never got into before. Even your baby cried to get out, it looked so. Tools were scattered all about the place, the stove was covered with dirt and rust, there was coal on the floor, ashes were tracked in with it, old clothes were lying in the corners and the windows were so dirty we couldn't see out of them. The place actually gave me the creeps, and if the inspection party sees it in that condition it's good-bye to another hundred. But they won't, for I am going down to clean it up. It will take me all day, I guess, maybe longer, but it has to be done."

This had the desired effect, as she secretly knew it would, for she had no idea of cleaning up the tool house. "Molly," pleaded Jim, "please don't say that; promise me to keep away from there. I know it looks bad enough, but I just ain't had time till now to clean it up. I'll put a man on it today." "Well," with a show of reluctance, "I'll give you a chance to do it, Jim," she said, and with a hurried kiss she sent him away.

From that day on she kept him busy and one morning, armed with a camera, she boarded No. 48 for Carlton Junction, the end of Jim's section. The day was ideal for picture taking and Molly, who knew the trainmen well, was permitted to stand on the rear platform and snap anything her fancy dictated. With eyes alert she eagerly scanned the track as it was unfolded to her view. Nothing escaped her gaze. A broken cattle guard panel here, a post hanging from a fence there, or a pile of cinders that had been dumped from some passing locomotive, all were snapped by the camera. That day proved one thing to Molly: Jim was actually more careless than even she had imagined. In fact, conditions were so bad she had used up her films before she got to the Junction. Boarding the next local for home, she ran the matter over in her mind. Jim had to be reformed, but heroic means would be necessary to do it.

That night when Jim got home she questioned him sharply about what he had done that day, but said nothing about her trip to the junction. "I did what you told me to do, Molly," he said with considerable enthusiasm for him, as the subject of picking up was always a painful one. "Everything is in great shape at the house, and that old wreck you spoke about has been thoroughly cleaned up."

"You mean you helped it, Jim," she said, "but you've a lot to do there yet before that place is right," she went on. "You should clean up all of that black ash and plant some grass seed. If you don't you won't have any grass there."

The next night when he came home Molly had the prints of her pictures, and after supper she got them out. "I always knew you were mighty careless, Jim," she began, "but I would never have believed conditions could be as bad as they are if I did not have the evidence here." She then produced the views to his astonished gaze, and as each one was passed over to him it was commented upon in a manner that made him wince.

"You see I have the goods on you," she continued mercilessly; "now, what are you going to do about it?" Jim was silent; for the first time he began to realize just what it meant to the company to have things look different.

"Molly," he said, looking up with a new light in his eyes, "I get you now. Just you give me a chance and I'll make that section of mine the cleanest on the system."

Molly was quick to note the sudden change that had come over him and it delighted her. "All right, Jim," she replied, "but don't forget I'm to be the foreman."

Jim certainly had caught the vision. From that day on, the way he and his men combed that section was the talk of the division. Every one of the men were as eager as Jim to make the section the cleanest one on the road. No one was more enthusiastic than Tony Raffello. In fact, Tony soon got the name of being a crank on the subject, and it was said that on one occasion he gave one of the gang a severe rebuke for spitting tobacco juice on the track, but this could not be verified.

As the summer wore on, however, Molly found that beyond the shadow of a doubt Jim's careless habits were a matter of history. The cure was effectual and complete, and the day before the annual inspection Molly boarded the train for the junction. This time the camera was not called into play. "Wonderful!" she exclaimed as the train passed each spot formerly an eyesore to her, but now in perfect condition.

Upon her return she went home by way of the track and stopped at the tool house for a final peep. Instead of the unkempt place she recalled seeing at the time of her first visit she now beheld a room as clean as any in her bungalow. Not only was the room clean and orderly, but the walls had been whitewashed, and tools hung or stood in neat rows along the walls. She gazed in admiration at all she saw. "I guess there won't be any question about who gets the hundred this time," she said to herself complacently as she started for home.

The inspection was made the next day, but it was three weeks before the results were known. One noon the sta-

tion agent called Jim to his office and handed him a registered package. With trembling hands he tore open the end of it. There were several papers pinned together, but only one interested him. Pinned to a long typewritten letter was a slip of blue paper. Turning it over so he could read the opposite side he saw, "Pay to the order of James Tyler—$100."

A few minutes later he rushed into the bungalow where Molly was busily engaged in frying doughnuts. "Jim Tyler, what on earth is the matter with you?" she exclaimed as Jim seized her in his arms while in one hand he held the bunch of letters and the check. Without saying a word he held the slip of blue paper before her eyes. Very calmly Molly read it, and then in a matter-of-fact voice she said, "Why, Jim, that doesn't surprise me. You've got some section now."

"Well," he replied, "I ought to have. I've got some foreman," and he bent down and kissed her.

Results of the Annual Track Inspections

WHILE THE COAL strike and other conditions interfered with the conduct of track inspections in several instances, a number of roads have maintained this commendable practice as in years past in spite of obstacles. In accordance with our established custom we present below the results of these track inspections as carried out on several eastern and middle-western roads:

R. F. & P. RESULTS

The results of the 1919 track inspections of the Richmond, Fredericksburg & Potomac and the Washington Southern have been tabulated and the prizes awarded. The road offers to its section masters a first prize of $100 in cash, a second prize of $65, a third prize of $55 and a fourth prize of $45. In addition, an individual prize is given by the engineer maintenance of way to the man receiving the first prize. This is in the form of a Maltese Cross on the face of which is engraved "First Prize" and the year and on the reverse side the number of the section and the name of the section master.

In making the inspection 12 subdivisions of maintenance work are considered. On a 100 per cent section, surface counts for 25 points, line for 20, ditches and banks, spiking and switches and sidings 10 each, and policing, ballast, spacing ties and joints and bolts, 5 points each. Each section is rated on all these subdivisions, but in awarding the prizes the cost per mile for maintenance is considered.

The following foremen received the prizes awarded this year: Henry Pearson, located at Accotink, Va., first prize; E. H. Elliott, Doswell, Va., second; W. B. Bullock, Guinea, Va., third prize, and J. S. Carpenter, with headquarters at Fredericksburg, Va., fourth prize.

ERIE PRIZE WINNERS

It has been the practice of the Erie for a number of years to award prizes to section foremen and supervisors whose sections and subdivisions show the most improvement after the season's work. The prizes are given in the form of payment vouchers which are prepared so as to reach the winners before Christmas. Prize section signs are also erected on the best sections, while the section on Lines East and that on Lines West showing the most improvement receives a payment voucher somewhat larger than the regular section prize winner's voucher and a grand prize section sign.

In determining who should get these prizes track condition is, of course, the feature of highest importance. Then come the general appearance of the right-of-way, signs, condition of fences, road crossings, ditches and all other items that go to constitute a perfect section and good maintenance. A specially constructed track inspection car is run each fall to determine the number of low joints, lurches, etc. Consideration is also given to the labor conditions in the various parts of the country and a foreman who has shown improvement with a few men stands a better chance of winning a prize than one who has had plenty of laborers and whose territory shows like improvement. The supervisors' prizes fall to the subdivisions showing the greatest improvement, which is decided on a similar basis to that of the section foreman, except that it involves a subdivision instead of a section.

A special prize of $200 was awarded to L. Sipple, supervisor of the Buffalo division, this year, he having the first subdivision that was rated at 100 per cent. The supervisors who received the regular first prizes of $200 are: J. H. Lynch, supervisor of subdivision 1 of the Buffalo division; John Lyman, subdivision 1 of the Mahoning division, and T. Bean, subdivision 3 of the Wilkes-Barre & Eastern Railroad. Second prizes of $100 went to John Carr, supervisor of subdivision 2 of the New York division; Ernest Pierson, subdivision 3 of the Meadville division and E. Trenholm, subdivision 1 of the Rochester (N. Y.) division.

Following is a tabulation of the successful foremen:

Division	First Prize of $100	Second Prize of $50
Main Lines East		
New York	F. Galanzo	J. Mullaney
Delaware	A. W. Wahl	C. Metzger
Susquehanna	H. E. Dininney	A. H. Barbara
Allegheny	A. Letro	W. T. Worrell
Buffalo	D. Canty	D. Belwigi
Main Lines West		
Meadville	Guy Comstock	John Dahlgren
Mahoning	Nick Truce	P. Anastis
Kent	C. D. Huffman	N. E. Scribner
Marion	G. McIntoch	M. F. Martin
Branch Lines		
Newburgh	T. McCarty	.....
N. J. & N. Y.	.....	M. J. Burke
N. Y. S. & W.	P. Heffron	A. L. Possinger
Wyoming	C. Gromlich*	J. F. Bushweller†
Rochester	T. Rinehart	Fannie Prinze
Tioga	F. H. Pierce*	S. L. Parmerter†
Bradford	F. Nuttzo*	.....
Allegheny	.....	T. S. Cahill†

*First prize $50 instead of $100.
†Second prize $25 instead of $50.

Grand section prizes of $125 were awarded to F. K. Worzel of the New York division on the main lines East and to George Fatsos of the Mahoning division on the main lines West.

LACKAWANNA AWARDS

The Lackawanna awards prizes for the best track sections on each roadmaster's division, consisting of $100 in cash and a silver medal for first place and $50 in cash for second place. Both the first and second prize men receive markers for their sections showing their respective ratings. A section foreman who has taken first prize on his section for three years receives an efficiency sign for his section and $10 per month extra compensation in connection with his salary. An efficiency man remains

in the efficiency list as long as his section is held within the same high efficiency.

The names of the foremen whose sections received the highest grading on each roadmaster's division, their headquarters and the name of the division, are given below:

Division	Name of Foreman	Section Headquarters	Prize
Morris & Essex			
East End	John H. Hall	Denville, N. J.	Efficiency
	N. Haley	Morristown, N. J.	First
	A. Yannotta	Summit, N. J.	Second
West End	E. Morgan	Blairstown, N. J.	Efficiency
	P. Tozzi	Portland, Pa.	Efficiency
	J. Shernce	Netcong, N. J.	First
	M. Smith	Port Murray, N. J.	Second
Scranton			
East End	Wilson Sutton	Mt. Pocono, Pa.	Efficiency
	John Kocella	Pocono Summit, Pa.	Efficiency
	John Martin	Gouldsboro, Pa.	First
	C. Hardy	Delaware, N. J.	Second
West End	R. Sity	Foster, Pa.	First
	R. Case	Alford, Pa.	Second
Buffalo	Thos. Carey	Painted Post, N. Y.	Efficiency
East End	Jos. Green	Savona, N. Y.	Efficiency
	J. Romeo	Litchfield, N. Y.	First
	R. VanValkenburg	Big Flats, N. Y.	Second
West End	J. C. Keating	Wallace, N. Y.	First
	J. Smith	Cohocton, N. Y.	Second
Bloomsburg	Daniel Blizzard	Danville, Pa.	Efficiency
	R. Shingler	Espy, Pa.	First
	B. Strauser	Bloomsburg, Pa.	Second
	J. Halloran	Whitney Point, N. Y.	First
Syracuse		Chenango Forks, N. Y.	Second
	L. Warner		
Utica	Jos. Biviano	Waterville, N. Y.	Efficiency
	Roman Cursh	Hubbardsville, N. Y.	First
	John Moran	North Brookfield, N. Y.	Second

RESULTS ON THE PERE MARQUETTE

The annual track inspection and awards for excellent track maintenance or improvements over last year were made on the Pere Marquette according to the same arrangements as in previous years, the basis of the awards being an inspection trip made by officers of the road.

The personnel of the various committees was as follows:

Line and Surface—A. L. Grandy, assistant general manager, chairman; C. J. Rist, division engineer, and William Madden, division engineer.

Roadbed and Drainage—C. S. Sheldon, engineer of bridges and buildings, chairman; F. P. Little, superintendent, and F. D. Harrigan, track supervisor.

Ballast Dressing and Shoulder—Job Tuthill, chief engineer, chairman; E. E. Cain, superintendent; J. A. Anderson, superintendent.

Policing, Right of Way and Station Grounds—H. A. Cassil, engineer maintenance of way, chairman; F. J. Meier, track supervisor; W. J. Long, division engineer.

Fences, Cattle Guards and Signs—A. R. Dewees, division engineer, chairman; William Meier, track supervisor, and G. W. Trout, signal supervisor and superintendent of telegraphs.

F. J. Meier and A. R. Dewees were unable to make the entire inspection trip, owing to unforeseen circumstances, and their places were filled by Frank Manning, assistant division engineer, and J. F. Tefft, assistant division engineer, respectively.

Track supervisor N. Jorgenson of the Petoskey division, north of Kaleva, received a prize of $100 for the division receiving the highest grade of any supervisor's district in the 1919 inspection tour. Mr. Jorgenson received this prize also in 1918. His standing in 1919 was 90.45 per cent; in 1918, 92.10 per cent.

Track supervisor Elmer Anderson of the Ludington division is the recipient of a similar check for the greatest improvement on any supervisor's territory over the 1918 grades. This division gained 0.73 per cent over last year.

Prizes of $25 were awarded the twelve section foremen whose names appear in the list below for the best general conditions on each track supervisor's subdivision. The names, headquarters and percentages scored are as follows:

	Per Cent
William Krajewski, Wyoming	90.1
William Harris, Fennville	92.2
W. F. Baily, Montague	92.8
Clarence Whiting, Alpine	92.7
Charles Sexton, Bellaire	92.4
George Wilkins, Sr., Williamston	93.2
A. Allen, Leamington	90.1
Abraham Armstrong, Birch Run	92.2
A. Benford, Mershon	93.2
Richard Morgan, Carsonville	92.9
William H. Moulton, Merrill	91.5
William Chudley, Mecosta	96.8

To one section foreman on each track supervisor's division making the greatest improvement, or in case of no improvement, the least decrease, as compared with 1919, was awarded a prize of $25, as follows:

	Per Cent
Peter Ciaccio, Benton Harbor	87.0
Fred Schnase, Grand Haven	88.7
Carl Robart, Bitely	83.7
Edgar French, Bendon	87.9
Michael Aceto, Rougemere	85.6
John Mannix, Courtright	79.9
Herman Forth, North Flint	87.2
W. J. Grigwire, Lake	92.9
E. Boughner, Yale	88.6
Lee Morse, St. Louis	89.8
Ben Huffman, Mosely	88.2

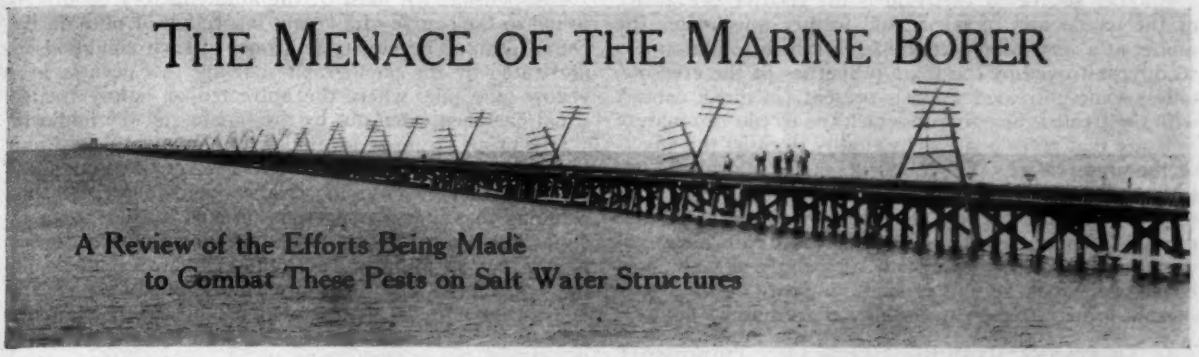
LONG ISLAND PRIZE WINNERS

For the second consecutive year Frank J. Nehrhoff, supervisor of division No. 4 of the Long Island, with headquarters at Patchogue, has been awarded the first prize of $200 and Coleman King, supervisor of division No. 2 at Jamaica, the second prize of $100, as the results of the annual track inspection for the best line and surface on a supervisor's division. The special prize of $100 for the greatest improvement in line and surface on any one division was awarded to William Steers, supervisor of division No. 5.

Prizes to the section foreman of $100 and $50, respectively, for the best line and surface maintained during the year on the five supervisors' divisions were awarded as follows: First prizes: Joseph Abbatiello, division No. 1; Frank Cicio, division No. 2; Michael Chisro, division No. 3; William S. Jenkins, division No. 4, and Michael Farraro, division No. 5; second prizes: Carmine Yannucci, division No. 1; John Razzanno, division No. 2; John Stasi, divisioin No. 3; Charles Petterson, division No. 4, and Jacob Reichart, division No. 5.

A MODERN USE FOR OLD WALLS—An electric railroad is to be built in Canton, China, on the site of the famous old walls which are to be torn down. The city has prospered so exceedingly during modern times that the walls, which measure 40 ft. wide and 30 ft. high, and which have stood over 1,000 years, are now almost in the center of the city. According to the English-American syndicate which proposes to do the work, the site of the walls will form an excellent place for an electric railroad to meet the demands of this rapidly growing Chinese city.

THE MENACE OF THE MARINE BORER



A Review of the Efforts Being Made to Combat These Pests on Salt Water Structures

DURING A STORM on the Gulf of Mexico a year or two ago, a barge moored at the docks of the Gulf & Ship Island Railroad at Gulfport, Miss., was sunk. When it was floated 45 days later the gunwale, composed of 6-in. by 8-in. untreated yellow pine sticks, was found to be completely honeycombed by the teredo. This experience, which has been repeated time and again under varying circumstances on the entire Gulf coast, on all of our Pacific coast and along a large part of the Atlantic seaboard, presents briefly the foremost obstacle confronting constructors of bridges, docks and other works of timber in salt and brackish waters. While the builder in inland waters has always had the satisfaction of knowing that any timber he placed in a position that insured its complete submergence at all times would be insured practically unlimited life, the salt water constructor knows that any unprotected stick in salt water is doomed to inevitable and speedy destruction.

The ravages of the shipworm or teredo are well known. The teredo does not eat the wood, but cuts into it as a place of abode. He derives his nourishment from the seawater, which affords him sufficient sustenance to attain a length of several feet and a diameter of one-half inch or more. The work of this type of borer is supplemented by others, chief among which is the limnoria or wood louse, which, as the name indicates, is an insect about the size of a grain of rice. While its destructive results have probably not been as great as that of the teredo, the limnoria has proven more difficult to overcome.

There is probably no application of creosote in the treatment of timber which has been as invaluable as that in piles driven in salt waters. That the introduction of this form of protection was received as a boon to the users of wood in sea water is attested by the record of many structures built with creosoted piles within a few years after timber preservation was placed on a commercial basis in the early seventies of the last century. The railroads were among the foremost to adopt creosoting as a protection for this purpose.

As a consequence of these early installations, a number of excellent service records have been developed. One of the earliest of these concerns the Galveston bay trestle, built by the Santa Fe in 1875, which was in service for 20 years. Piles in this structure which remained in place after the trestle had been dismantled were still standing in 1912. Another record of possibly a more definite character concerns the Long Wharf of the Southern Pacific at Oakland, Cal., dismantled in 1918-19, which contained piles that had been in service 29 years. But such records are not always obtained. Treated piles often show serious damage after but a few years of service. Fortunately, it has been shown in nearly all instances that the cases of disproportionately short life are penalties for inadequate or imperfect treatment and improper practices in installation. Nevertheless, certain cases have been brought to light where piles have been attacked by borers after a service life of from 8 to 10 years, when, according to all the available evidence, the character of the treatment was entirely in accordance with accepted practice. But in spite of these disconcerting circumstances, the fact remains that timber piles properly treated with creosote are insured a relatively long life as compared to an extremely short service to be expected from untreated material.

This in general is a rough statement of the problems confronting the railway officer responsible for the construction and maintenance of timber structures exposed to salt water. It is a matter which concerns both the structural engineer and the timber treating specialist; the former has endeavored to perfect an exterior sheathing or protection to keep the animal life in the water from contact with the wood surface, the latter has attacked the problem from the standpoint of the chemist, the entomologist and the student of wood structure. Special committees of the American Wood Preservers' Association and the American Railway Engineering Association and the staff of the United States Forest Products Laboratory have been at work on this subject for several years. That their labors have borne fruit in the way of improved practice is beyond question, but they still have much work ahead of them before the problem may be said to have been thoroughly solved.

A Complex Problem

Studies of the effectiveness of creosoting as a protection against marine borers are fraught with complications. The intensity of the destruction wrought by these pests is subject to variation with the location, the time and the species of life predominating in the particular locality. The severity of conditions at a given location has been measured by the rapidity with which untreated wood is destroyed, but even at a given place conditions do not always remain the same. Thus, a recent examination of a large number of piles in docks at Pensacola, Fla., that had been subjected to very severe attack by borers failed to disclose the presence of a single live specimen of teredo. The explanation offered was that a series of heavy rains just preceding the inspection had caused a large runoff of fresh water into the bay with the result that most of the borers then present had been killed. The same influence results from the presence of currents of fresh water in arms of the sea. On the other hand, conditions are aggravated following seasons of long drought, or an unusually high tide. While any appreciable freshening of the water serves as a retardant to the vitality of these sea water pests, some species will be found in water only mildly brackish. Thus, at Manchac Pass, where the Illinois Central crosses an arm of Lake Pontchartrain, the sphæroma, a marine borer of only recent discovery, has caused considerable trouble with cypress and creosoted pine piles.

Another source of variation is the relative prevalence of the teredo and limnoria; the former must enter the timber as a very minute organism, in which condition it is readily destroyed by the toxic properties of the creosote, unless some untreated wood is present (in direct contact with the treated member) in which the teredo can mature to a size that gives it sufficient vitality to resist the effects of the preservative. The limnoria, on the other hand, attacks the wood as an adult insect, which is less susceptible to poisoning, and for this reason is a much more serious menace than the teredo. The increased prevalence of this pest in recent years, noted particularly at Galveston, is one of the most serious problems imposed on those who seek to protect timber by the injection of toxic fluids.

THE TREATMENT MUST BE CARRIED OUT THOROUGHLY

It is a matter of common knowledge that the requirements in treating timbers to resist the marine borers are much more exacting than when treating to resist decay only. Of primary importance, naturally, is the quality of the preservative, the requirements of which in general terms are that it must possess toxic effects on the animal life present in the water and be able to retain that property after years of submersion. This is a matter of many technical complications and has been the subject of investigation through the study of actual structures as well as specimens of piles and timbers placed in sea water after treatment by various processes and with different fractions of the creosote oil. Owing to the fact that the present perfection of the art insures the protection of the wood for a considerable number of years, it will be some time before the tests now in progress will be completed. However, a series of inspections of actual structures carried on over a period of years has shown that in those cases where creosoted piles have been severely attacked after what would appear to be too short a service life, inadequate and improper treatment rather than defective material have been primarily responsible.

The treatment, to be effective, must provide a shell of treated wood that is absolutely continuous and of such thickness that checks and shakes or the abrasions and abuses of service will not expose untreated wood to contact by the borers. To this end there is a common agreement among wood preserving authorities that the treatment must be much heavier than will suffice where resistance to decay is the only requirement. An injection of 24 or more pounds of creosote per cubic foot is deemed necessary, not so much with the idea that an actual absorption of this amount is required for success, but that as a consequence of the variation in the relative susceptibility to absorption, an average penetration of 24 lb. is required to insure that the pieces of timber having the greatest resistance to absorption will receive an adequate amount of the creosote. It is an unfortunate circumstance that certain factors entering into the process of treatment tend to produce so marked a variation in the distribution of the treatment that the penetration may be inadequate even though the average absorption is as high as the figure stated above. This is well illustrated by the cross-sections of piles shown in some of the photographs. These show well defined areas of untreated sap wood, in some cases coming almost to the surface of the pile. These examples are not the result of inherent obstacles to timber treatment, but result from a failure to draw out the moisture in the wood cells before attempting to inject the oil. The large untreated areas which lie close to the surface in one specimen shown are the result of what is called a water pocket, an effect of improper seasoning. Another view shows radial streaks of untreated sap wood as a consequence of failure to skin off the inner bark thoroughly. These two conditions more than any others are responsible for most of the unsatisfactory conditions found in the course of a recent inspection of piles on the Gulf Coast. The inevitable sequel to such conditions is illustrated by the photograph showing two pockets in a yellow pine pile, where the untreated or lightly treated wood has been eaten out by the teredo and the limnoria.

One prime requisite for the heavy treatment is long and high pressure steaming. Some advocate thorough air seasoning before steaming, while others deprecate this, claiming that it is a dangerous practice in the Southern states because of the rapidity with which incipient decay may be set up in the warm, humid climate. This condition, of course, may be apprehended by sawing off the ends of the piles before treatment is undertaken, a practice followed invariably at the treating plants of the Atchison, Topeka & Santa Fe. There is also a serious question whether the long period of steaming can be thoroughly effective in removing the sap and other moisture in all cases. The water pocket formed in the side of the log that was "down" while in storage is evident in too many treated piles in spite of the long steaming. The seriousness of the situation would seem to demand greater attention to the possibilities of thorough air seasoning.

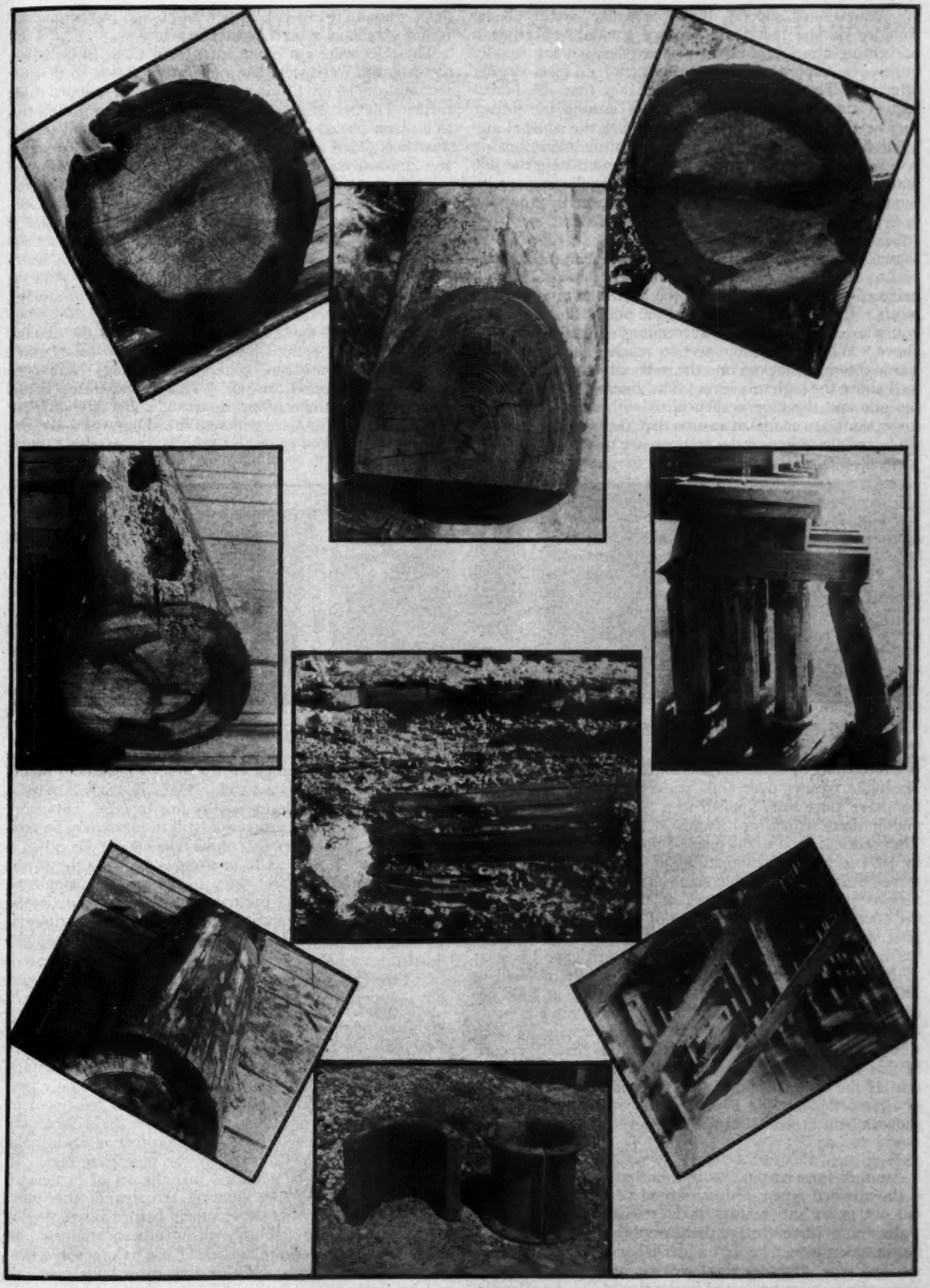
Another matter of dispute arises with regard to the effect of careless skinning. Because the presence of these strips of inner bark is not always reflected by poor treatment in the wood directly underneath, it is argued by some that this is of no importance, but since in many cases poorly treated streaks are found directly under the unskinned spot, good practice requires that the skinning be done thoroughly.

Some idea of the results that accrue from thorough treatment is to be obtained by an examination of the adzed section made from one of a number of piles taken from the ruins of an old highway dock at Port Bolivar on Galveston Bay. These piles were driven about 1876, and, although they were in the water over 40 years, they show practically no sign of attack by the borers. The treatment of these piles was thorough; the creosote oil had penetrated through and through. There was not the least sign of any wood not thoroughly impregnated with the oil.

PROTECTION BY EXTERNAL SHEATHING

Since the destruction of wood by the marine borers is the result of an attack that must, of necessity, begin on the surface, it is but natural that efforts were undertaken years ago to perfect some form of sheathing which would tend to prevent any form of animal life present in the water from coming in direct contact with the outside of the timber. In general, the use of such physical protection has been undertaken largely as a reclamation measure to save structures on which the borers have already made considerable inroads, rather than something that was applied at the time the structure was built. One of the latest efforts along this line is the application of cement mortar by means of the cement gun to the piles of trestles on the Puget Sound Traction, Light & Power Company to protect piles in Puget Sound. This process is, of course, of limited application since it can be applied only to such portions of the piles as are above the surface of the water at low tide.

Many other schemes have been put into practice in the last 40 or 50 years, some of which were of real practical value. Among plans that have been tried are metal sheathing, large headed nails, burlap coatings and pipe coverings of concrete, cast iron and terra cotta. The metal sheathings and burlap coatings proved to be of little value because their usefulness was destroyed quickly as soon as there were any breaks in the continuity of the covering. The pipe protections, on the other hand, have been



STUDIES OF THE MARINE BORERS AND METHODS TO OVERCOME THEM

Examples of Successful and Ineffective Creosoting.
The Consequence of Poor Treatment. What Teredo Will Do. Bent Protected by Cast Iron Pipe.
The Effect of Poor Skinning. Iron Pipe Protection. Untreated Braces Eaten Away.

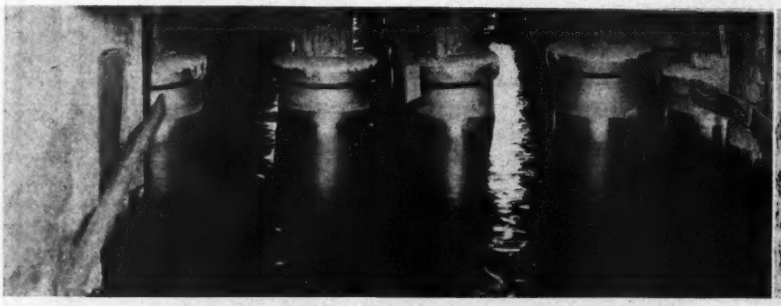
an unquestioned success, their particular virtue being founded on the fact that they are not only effective in preventing attacks on newly-driven piles, but are equally positive in stopping the destructive action on piles already affected. This is founded on the fact that the borers require the free circulation of water around the timber they occupy in order to live. They attack the wood at any point from the high water line to the mud line, but do not go below the mud line. Therefore, enclosing the pile with some form of pipe and filling the annular space with sand or possibly with cement mortar effectually stops the destruction as long as the filling is present.

Sections of the cast iron pipe used for this purpose are shown in one of the photographs. To facilitate application to a capped pile, these cast iron sections are made in half cylinders with flanges on the horizontal and vertical joints. These are bolted around the pile at the water line and allowed to descend as succeeding sections are added above. When the bottom section reaches the ground the whole column is jacked into the mud, while the top is kept well above the high tide level. The annular space between the pile and the pipe is then filled with sand. Frequent inspections are made to insure that the sand remains in place and that none of the sections are broken.

pipes were added in 1912, when additional protection was found necessary after 12 years' service.

The piles were cut off in turn from 12 to 14 in. below the caps and were jacked or pulled to one side so that the sections of 18-in. to 22-in. pipe could be slipped over them. The first section of pipe was held up by a sling tied to a plank placed underneath the pipe. A second section was then added and the joint packed with rope or oakum and covered with hot pitch. The pipe was then allowed to settle until space was made for the addition of another section. This process was continued until the first section reached the bottom and became thoroughly embedded in the mud. For this penetration and some clearance above high tide, 20 ft. of pipe was required for a water depth of about 16 ft. After filling the pipe with sand the top bell was closed with a cap of Portland cement mortar, and the pile jacked back under the cap.

Concrete pipes made in half cylinders after the manner of the cast iron sections have also been used to a limited extent. In other cases, concrete sheathings have been cast in place around the pile. This is illustrated in the photograph of some piling under a wharf at Gulfport, Miss. The cast-in-place concrete sheathing was used very early in the attempt to protect piles by the external cover-



Piles Protected by Terra Cotta Pipe

Concrete Cast Around a Pile

Protections of this kind were used on the Louisville & Nashville trestles over Gulf waters in the early nineties and have since been applied to a large proportion of the piles in these structures between Mobile and New Orleans. They were applied to the piles of the Bay St. Louis trestle in 1891 after an examination of 3,600 creosoted piles driven in 1879 showed that some additional protection was necessary. The effectiveness of this safeguard against the borers is indicated by a record of 90 per cent of the piles still in service in 1919. The trestle over Biloxi bay has nearly 400 bents driven in 1879, which gave 14 years of service before the external protection was applied in 1893. The fact that 60 bents were replaced in 1908 because of settlement and that the original four-pile bents were strengthened by the addition of one pile on each side in 1910, has served to complicate the renewal record of this structure, but it is estimated that not over 10 per cent of the original piling was removed because of decay or destruction by the borers. One of the photographs shows a bent protected in this manner.

Terra Cotta Pipe Also Effective

Another form of pipe protection that has been effective is the vitrified pipe. This was used as early as 1891, but did not prove satisfactory in locations subject to rough water and driftwood since there were too many breakages, but in quiet water like that under wharves in harbors, the vitrified pipe is giving good service. One of the photograps shows piles protected by terra cotta pipe under the Commandancia wharf at Pensacola, Fla. This wharf was built in 1901 with creosoted piles and creosoted caps. The ing. Concrete sheathings were applied to the piles of the Muscogie wharf at Pensacola, Fla., as early as 1885. This structure was destroyed by fire in 1894, but many of the piles with this protection still in place may be seen to this day. This type of protection cannot be called a real success. It is next to impossible to make the forms tight enough to un-water them so the concrete cannot be applied in the dry and the opportunities for voids in the concrete poured under water in an annular space three to four inches wide and 16 ft. deep can readily be appreciated.

The Piles Must Be Treated in Any Event

One point must be kept definitely in mind in any consideration of the value of these external protections. The piles must be treated to resist decay whether they are protected against borers or not. The long life obtained in the trestles on the Louisville & Nashville was only possible because the piles had received a heavy treatment of creosote. Otherwise, they would have decayed at the water line and above in spite of the protection against the limnoria and teredo afforded by the pipe coverings. In conclusion it must be admitted that the art of protecting timber against attacks by limnoria, teredo and other marine life requires further development before a high degree of perfection and reliability will have been attained. In the face of this fact, the continued use of creosoted timber piles for the great bulk of structures built over salt and brackish waters serves to demonstrate the economic value of this form of construction with the protection that can be given it with the means now available.

THE CAUSE AND PREVENTION OF RAIL CREEPING*

A Discussion of Different Important Factors Producing a Longitudinal Movement in Railroad Tracks

ONE OF THE many difficulties with which the maintenance of way man has had to contend is the creeping or longitudinal movement of rails relative to the ties or to the roadbed. Some 30 to 35 years ago this difficulty was more or less unheard of, but in recent years, with the increase in the volume of traffic and the greater weight and speed of trains, this phase of maintenance work has become of considerable importance. Many plans have been tried, many theories advanced and many cures introduced, some successful, or nearly so, and others rank failures, in an attempt to find the exact cause or causes, and to prevent this movement. Though in a large number of cases this has been accomplished in so far as reducing the creep to a minimum, it is doubtful whether any large number of men concerned with this problem have a good understanding of it or whether they are handling the situation on their particular road as economically and practically as it might be done.

Causes of Rail Creeping

The chief factors which might tend to produce creeping of rail are:

1. The driving wheels of the locomotive hauling the train, when rotating, have a tendency to thrust back the rails in the opposite direction to the moving locomotive.
2. The cars, etc., being hauled by the engine have a tendency to pull the rails in the same direction as that in which the train is moving, due to the friction between the wheel and the rail and to the flange friction of the former when binding against the rails.
3. The brakes, when applied on the wheels of moving cars, produce a skidding action which tends to force the rails in the same direction that the cars are moving.
4. The impact given to the running-on end of the rail by each succeeding wheel of the moving train, has a tendency to thrust the rails in a forward direction.
5. Changes of temperature, the expansion and contraction of the rails, causes them to move in the direction of the traffic, with the result that the expansion spaces are closed up or opened out.
6. The weights of the moving vehicles on their wheels produce waves of deflection resulting in a tendency to roll out the rail in front of the wheel.

The first factor is a result of the traction force which must necessarily be exerted either in bringing a train from a standstill up to the rate of speed required or in keeping a train at some designated speed. In the first instance the force required must overcome the inertia of the train, the frictional resistance of its parts and the resistance of the air. While this may amount to a considerable force exerted on the rails, it is actually negligible in comparison to the other factors producing creep and as it is counter to the direction of traffic it is only considered in the case of heavily loaded trains on the steeper ascending and descending grades where it may affect the movement to a more or less appreciable degree. The effect of this force is to retard the amount of creeping on the ascending grades, in some cases actually effecting a movement counter to the direction of travel and through the diminution of this force by the cutting down or shutting off of power it may apparently increase the amount of creeping on descending grades, other things being equal.

Factor No. 2 takes into consideration the frictional resistance of the wheel or of the wheels and flanges and is obviously a small force, having but little effect except on curves where the super-elevation is either greater or less than necessary for the speed of the train. In either case, the wheels tend to hug or crowd one of the two rails and, due to the frictional resistance thus created, there is a tendency for the rails so crowded to creep to a greater degree than the other. This irregular or uneven creeping of rails on curve is not, however, entirely due to this cause, but is influenced in the main by factor No. 6, which will be discussed later.

Considerable importance has been given by engineers and maintenance men to the effect produced by braking as listed under factor No. 3. The skidding action so produced is most noticeable at approaches to stations, etc., requiring a large percentage of stops, and is evidenced by the gradual closing up of the rail joints over the distance where the brakes have been applied, becoming a maximum at or near the point where the brakes are released. In most cases this would have but little effect, as the resistance of the track would tend to overcome the drag thus created, but in connection with the more or less ever-present tendency to creep through the deformation or the rolling-out action of the wheel, the resistance is broken down and the rail moved over the portion affected by both forces in combination.

Factor No. 4, or the result of the impact on the receiving end of the rail by each succeeding wheel, doubtless has some effect on creeping, the amount depending, of course, on the efficiency of the design and maintenance of the joint. Little attention, however, has been given to this cause, for, in the majority of cases, rail joints are in fair condition and, the impact thus being at a minimum, little movement has resulted through its effect.

The effects of changes in temperature, factor No. 5, have been one of the most favored of the supposed causes for creeping of rail and are in truth an important factor to be considered. It is obvious that there can be no creeping of rail resulting from a change in temperature alone, for the movement thus created by the expansion or contraction of a rail would tend to be in two directions, each being approximately equal and opposite, depending on the forces holding each half of the rail. However, this condition does in most cases materially increase the amount of rail creeping, especially during the summer season when there is a considerable variation in the temperature of the rail, which is attributed to various causes which are discussed in connection with factor No. 6.

Experiments Shed Light on Causes

This last factor is perhaps the most important and the chief cause of rail creeping, its effects being greater and its action more difficult to prevent. Much has been written about this tendency to produce movement by the rolling action of the wheel and several experiments made by Frank Reeves, an English civil engineer, have thrown considerable light on this subject.

The experiments began by laying a planed white pine lath about ¼ in. by 1¼ in. by 8 ft. long on a planed hardwood bench. After rolling a wooden wheel 12 in. in diameter and 2 in. thick over it several times in succession in one direction, the lath was found to have moved bodily about two millimeters in the direction of travel, the total amount

*Abstracted from papers by Frank Reeves and Harry Powell Miles, submitted before the Institute of Civil Engineers, London, Eng.

of the latter having been 14 meters. The result was so astonishing that a series of experiments were made, using two wheels of the same dimension, one being 25 times the weight of the other, care being taken to avoid a possible movement of the lath by any influence outside that of the rolling wheel. The material used consisted of a pine lath, an iron lath and a strip of vulcanized rubber which was old and rather hard, all having the same dimensions of ⅜ in. by 1½ in. by 8 ft. or 2.5 meters long. Only the central portion of the lath, 2 meters in length, was used, the wheel being run over it five times to make a total run of 10 meters. Measurements were taken from a pin driven in or secured to the lath at one edge and to one clamped on the bench, readings being taken by means of a micrometer to 1/100 millimeter.

Four methods or means of support were used as follows: (1) The lath on the bare surface of the bench, (2) the lath on small pieces of hoop-iron representing ties and spaced 14 centimeters apart, (3) the same as No. 2, with the addition of a strip of rubber inserted between the ties and the bench, thus representing a yielding foundation and (4) the lath resting directly on a strip of rubber. The results of the experiments were fairly consistent in their uniformity and furnished a basis for interesting comparison. With the lath flat on the bench the creeping was 0.31 millimeters, laid on iron ties it was 0.77 and on ties and the strip of rubber it was 1.01 for the light wheel and 3.07, 13.77 and 5.26, respectively, for the heavy wheel. The iron lath gave a creep of 0.16 millimeters when laid flat, 0.33 millimeters when laid on the ties and 0.38 on the combination of tie and rubber strip for the light wheel and the following respective amounts, 1.16, 0.83 and 0.29 for the heavy wheel. In conjunction with the above tests, it was decided to see what effect the rigidity of a lath would have on the amount of creeping and accordingly the lath was placed on edge and the same procedure followed. The result obtained showed a diminished creeping, the total amount of the movement in each case being from 30 to 60 per cent less than that obtained for the same piece when laid flat.

The result of these experiments tended to show that the creep is in the main a factor of the deformation of the rail caused by the action of the wheel or wheels and may be likened somewhat to the movement of dough when rolled under a rolling pin. If an elastic substance like rubber be substituted for the dough it is not permanently extended, but it does creep and in a marked manner, giving an exaggerated imitation of what takes place when a wheel passes over a rail. Rubber and steel are both elastic substances differing only in the degree of elasticity and consequent deformation. It would naturally follow from this that the amount of creeping would tend to be in proportion to the amount of deformation, that is, it would tend to increase through an increased wheel load or by a diminished rigidity of the rail. This is borne out by the fact that the white pine lath crept less when on edge than when flat and that the iron lath crept less than either case of the pine and still less when on edge. Actual practice on railroads has shown that the worst cases of creeping have generally occurred on a yielding roadbed, where a visible wave action was set up under the load and that in general creeping has increased with an increase in the wheel loading, other conditions remaining the same.

CONDITIONS THAT PROMOTE CREEPING

The following theory for the occurrence of creeping in a rail has been advanced, based on the result of the preceding experiment and from observations of actual instances of creeping taken from general practice. Referring to the figure, a wheel is assumed to be advancing in the direction of the arrow upon a rail supported on a uniformly yielding foundation. Taking a point P on the base of the rail and slightly ahead, and another point A on the part not yet affected by the bending action, the condition of the portion A P is that the head of the rail is in tension and the base in compression. The consequent shortening of the base measured from A will cause the point P to move forward and as the wheel advances, pressing more and more heavily upon the portion under consideration, there is a tendency to fix it in its slightly advanced position while passing over the point. On leaving the point P behind, the condition of the portion P B is that the head of the rail is recovering from a state of tension and the base from compression. The consequent elongation of the latter again causes the point P to move forward as it rises.

If this theory is admitted, there is apparently a forward tendency, both in depression and in recovery, which would explain the phenomenon of creeping. This would also explain why a sharp flexure of the rail would produce more creeping than an easy one, irrespective of the total depression as, for instance, in the case of heavy wheel load on light rails, a condition notable for the amount of creeping it produces.

The experiments performed show that such a phenomenon does exist and that the advance of the rail is more dependent upon this factor than upon such conditions as change of temperature, hammering of wheels on rail joints, frictional resistance tending to drag the rail, and the effect of heavy and continuous braking, though these factors do enter into it and assist materially in increasing the total amount of creeping. Ordinarily the combined effect of these factors will produce no move-

Diagram Illustrating One Cause of Creeping

ment of the bulk of the ties where the road is well or even moderately well ballasted, but unless the rails are securely held by means other than the rail joints there will, in the more extreme cases, be a movement of the rail which will close the rail joints and as a result the fastenings of the joint to the ties are subjected to a heavy strain which will tend in time to produce a movement of the joint ties. It is in connection with this that temperature changes have their greatest effect, the expansion of the rail either closing up the space left for that purpose and thus quickening the effect of creeping through the reduction of the amount of allowable travel before transmitting its effect to the adjoining rail or by the expanding force of the rail exerted on the adjoining rail, aided by the closing of the spaces through creeping. Just how much creeping is affected or aided by the changes in temperature of the rail is difficult to estimate, but that it is a serious factor where the movement occurs, is well known. There have been numerous instances where roads in good condition have shown little or no creeping over those portions having an approximately even temperature or at least no great variance and these instances can only be explained satisfactorily by the supposition that the powerful expansive force of the rail under a rise in temperature overcomes resistances that held the rail from creeping during normal temperature.

On single track lines there is little or no creeping under normal circumstances, but if there is a preponderance of traffic in one direction creeping will take place in that direction. In some cases one rail of a single or double

track will creep more than the other, this condition occurring more often on curves where the outer rail tends to creep to a greater extent than the inner. This variance when found on a tangent is probably due to the difference in the resistance offered both by the rail joints and the ties, and to roadbed conditions. In some forms of construction there are cross drains either at or near the joint ties that lessen the resistance of those ties to the movement of the rails.

On double track the difference in movement of the two rails is more aggravated in that the traffic is chiefly one way and that the loose ballast near the outer end of the ties offers less resistance to their movement in comparison with the solid ballast between the two lines of tracks. As the latter is pushed in both directions by the two tracks, the conflicting "streams" of ballast greatly increase the resistance on the inner end of the ties. On curves the tendency is for the high rail to run ahead and this may be attributed to the effect of the super-elevation in relation to train speeds and weights. Train speeds are, as a rule, generally higher than that for which the super-elevation was intended and as a result the wheels bear heavier on the outer rail, causing an increase of the rolling out deformation which, in conjunction with the drag caused by wheel and flange friction, gives a greater amount of creeping to that particular rail. On double track curves where the high rail is one of the inner rails the effect is dampened by the increased resistance of the ballast resulting in a less variance between the two rails of that track.

Rail creeping may be considerably reduced through the construction of a firm roadbed laid with rails of ample weight to resist the deformation of the known weight of traffic over them, on ties spaced close together and well tamped, the ballast being made as firm as possible in front of the tie to give the maximum resistance. A far better result will be obtained by the use of tie plates and rail anchors, for even under the best conditions some rail creeping will occur, at least during the summer months, for reasons already stated. Ordinary cut spikes or screw spikes offer but little resistance to the movement of the rail, even when newly driven and where the rail is laid directly on the tie the pounding and cutting action soon renders the holding power of the spike valueless so far as creeping is concerned. With the use of tie plates a larger surface is presented for wear on the tie and in addition, through the resistance offered by the rough surfaces of the plate and the base of the rail, considerable retarding force is exerted. The more logical solution of this problem, however, lies in the proper and methodical use of some form of rail anchor which may consist of any device or devices that will so bind the rail to one or more ties that it cannot move without moving its support.

Various forms of rail anchors have been introduced for this purpose, ranging from a combination tie plate and anchor to clamped-on devices to be installed at or near the center of the rail, each having its advantages and disadvantages, but all having for their main object the restriction of rail creeping or other movements of the rail and are more or less successful in this accomplishment.

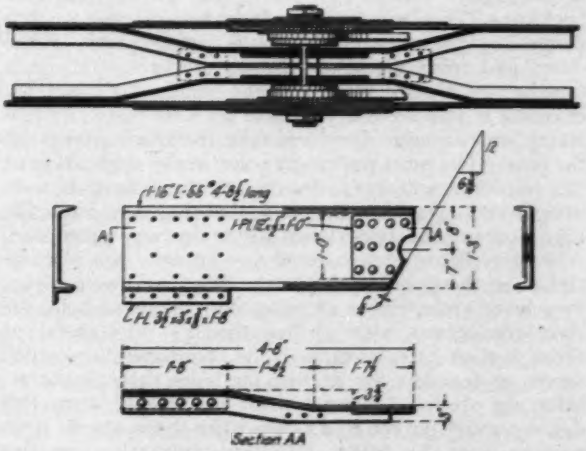
"KAPE YOUR HIDS DOWN"—The following are some of the instructions given section men by one of the best section foremen I ever knew:

"Min, there comes a pathenger thrain. Kape your hids down; there might be a ar-ti-ficial on the rear; if they ware and he seed yeas wid your hids up he might sind me a excommunication. If your hids are always down whin ar-ti-ficials pass it would have a tindency to give me priestage."

J. S. M.

REINFORCING THE PINS OF A TRUSS SPAN

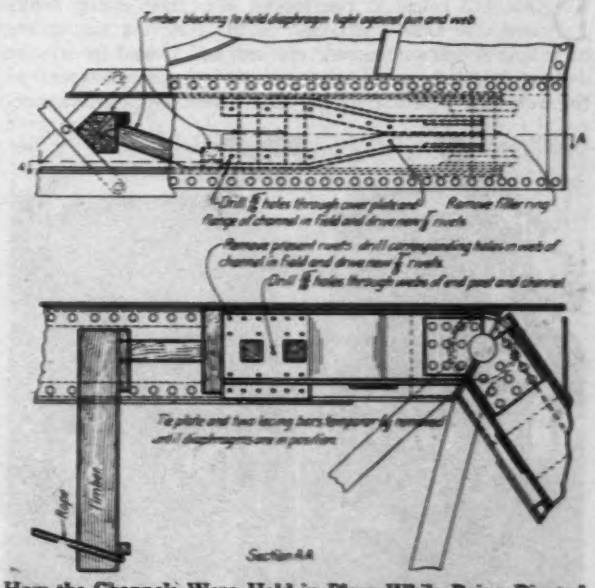
SOMETIMES the principal weakness of an old truss span is in one or more of the pins and this constitutes a condition that is very hard to correct, since a pin cannot be replaced by a larger one under ordinary



Details of the Reinforcement

circumstances without putting the bridge on falsework. That usually involves a greater expenditure than the increase in the carrying capacity of the span warrants. There are exceptions to this rule and the drawing illustrates how the hip pins of a truss span were reinforced by obtaining a better distribution of the loads on the pins. The structure was a 153-ft. 8-in. through truss bridge over the Skunk river at Hayesville, Ia., on the Chicago, Milwaukee & St. Paul.

The weakness in pins arises usually from too great a bending moment as affected by the position of several



How the Channels Were Held in Place While Being Riveted

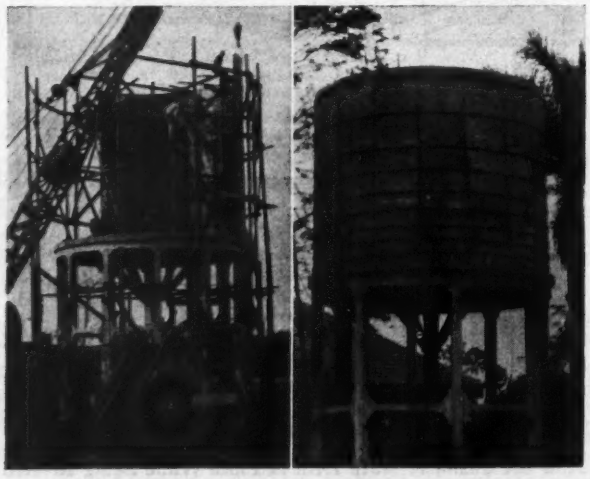
members coming together on the pins. In this case, the bending could be reduced by applying a part of the load from the top chord and end post to the pin at a second point of application inside of the eye-bars serving as web members, instead of applying all of the load of the chords on the outside only. Fortunately, the packing of the

pins was such that this change could be made. A pair of short pieces of 15-in. 55-lb. channels was introduced inside the chords in the position shown. These were bent so that one end of each of them could be riveted to the webs of the chord members while the other end was in bearing against the pin just inside of the eye-bars. To make a member of this kind effective in compression it is necessary that it be reinforced properly against buckling. This was readily done by riveting the top flanges of these channels to the cover plate of the chord and tying the lower flanges of the two channels together by a plate located at the bend. To insert the channels it was necessary to take off a tie plate and two lacing bars on each chord and take the spacing rings off the pins. The most important point in the application of this reinforcement was to insure that these channels were in tight bearing against the pin so that they would actually take a part of the stress when the bridge was under load. After the pieces were inserted and brought into place as shown in the drawing they were pried against the pins by a lever arrangement as indicated. While so held, the rivet connections were drilled through solid metal or through rivet holes already in the chord members which served as templets for drilling the holes through the reinforcing steel. A special point was made to do this drilling and drive the rivets only when there was no train passing over the bridge. Observations taken on this structure after the reinforcement had been in place and the tie bars and lacing bars restored to position indicate that the reinforcement is functioning properly under load. This reinforcement was developed by the bridge department of the Chicago, Milwaukee & St. Paul under the direction of C. N. Bainbridge, engineer of design.

CONCRETE WATER TANK ON THE WESTERN RAILWAY OF HAVANA

By JOHN P. RISQUE
Editorial Representative in South America

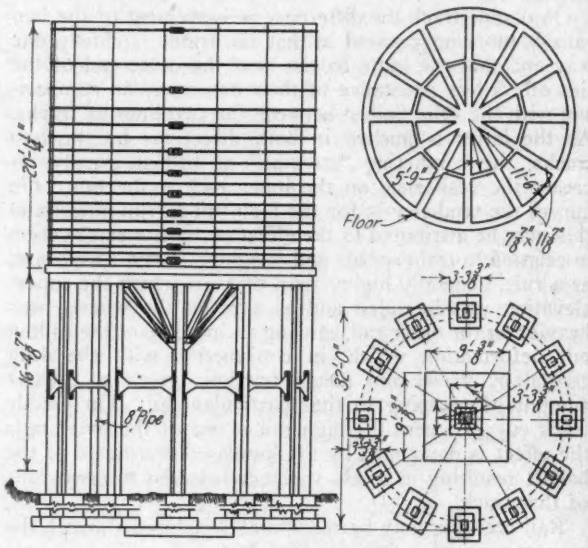
DEMOUNTABLE reinforced concrete water tanks with the tank itself cast in the form of the staves of a barrel were designed, erected and placed in service during the war period by the engineering department of the Western Railway of Havana when the price of steel



Erecting the Knock-Down Water Tank and the Tank Complete

in Cuba reached unprecedented levels and became, as a matter of fact, almost unobtainable at any price.

These tanks, of which five were built with capacities of 50,000 gal. each, were erected at a cost of 7½ cents per gal. of capacity and have given uniformly good service with a material reduction in the amount of painting required. They replaced steel tanks which, in the humid climate of Cuba, required frequent painting and were short-lived because of the rusting which sets in in spite of the extreme care exercised in painting. Through their demountable or knocknown feature they are particularly adapted to the needs of the railroad which, in



Details of the Tank

meeting the changing conditions and in keeping pace with the improvements of the service, has frequent occasions to change the location of water stations.

With concrete used as a substitute material for steel the portable feature could be secured in the tanks only if unit construction was adopted. Consequently the design was predicated on the use of pre-cast members, all of which, including the supporting columns, the floor and the tank staves, are molded at a central yard and shipped to the point of application. With the exception of the roof, which is of wood, concrete is used throughout the entire installation.

The concrete framing that supports the floor of the tank is cast in two equal halves which are bolted together with ⅞-in. bolts at regular intervals. The floor is cast with a recess extending around its outside diameter, the recess being sufficient to permit the insertion of the lower ends of the tank staves and two ¾-in. square reinforcing bars.

The floor is supported on 13 rectangular columns, 12 of which are arranged on the circumference of a circle which has for its center the thirteenth or main column. All of the supporting columns rest on concrete piers, as shown in the drawing. The upper ends of the upright supports are fastened to the floor of the tank by means of bolts which pass through loops formed by the reinforcing rods of the floor. The radial supports which branch out in the shape of braces from the main or center column are provided with cored holes for the insertion of the bolts to secure the upper end of the support to the tank floor.

In erecting the staves of the tank the lower ends of the staves are set into the groove provided in the floor after the inside face of the joint has been well painted with pitch. Two reinforcing bars are then placed in the groove outside the staves and the groove is then filled in with concrete, after which the inside joint is caulked with oakum. After the job is complete the inside and

outside of the tank are painted with coal tar, which is followed with a coat of pitch.

The hoops retaining the staves are of ¾-in. square iron with two turnbuckles to a hoop. The hoops are spaced in accordance with the loads at the respective points and are lla of the same cross-section.

Some of these tanks have been in use for months and are giving good service. No leaks have developed, and the use of concrete instead of steel has resulted in an important saving in upkeep. The tanks were designed and erected under the supervision of Philip Hammond, chief engineer, and C. P. Bonner, assistant engineer.

Keeping All Track Bolts Tight

BY E. R. LEWIS

THE DAILY INSPECTION of track is generally recognized among maintenance officers to be a duty of primary importance, yet it is a question whether it has not become to a certain degree perfunctory in some details since the railroad motor inspection car came into general use. Undoubtedly many details of track cannot be properly inspected from the deck of a moving car at the speed at which most inspection cars are operated for the daily inspection. That "the way to inspect track is to walk over it and back again" is as true now as ever.

It is likewise true that many details of railroad maintenance do admit of motor car inspection, which is made to great advantage, in the saving of time and transportation of tools and materials for light repairs. The best practice seems to still demand the services of the track walker, especially to keep track bolts tight. The poor condition of track bolts and consequently of joints, the large percentage of rail failures due to breaks through bolt holes, the battering of rail ends, the breaking of splices, the enlarging of bolt holes, the battering of track bolt threads, the pumping of joints, the excessive wear of crossing and other frogs, are all largely traceable to the loose bolt as the primary cause. There is no other one duty so necessary to economical track maintenance as *keeping all track bolts tight all the time.* It is highly probable that no item of maintenance work is so generally neglected on the railroads of America. After bolts are tightened through a section, the track walker should be able to care for them single-handed and keep them all tight all the time.

Broken rail reports covering all classes of tracks on one railroad during six months show that nearly 40 per cent of the rail failures resulted primarily from loose bolts. On some other roads the bolts have been kept tight successfully by one track walker on each section, after being thoroughly tightened by the section gang during the surfacing campaign. No extra labor was hired. After the first month it was found possible to raise the standard of maintenance while keeping the number of section men constant, due to the decrease in the total work necessary, on account of all the bolts being continually kept tight. Eventually the track walkers had time to stop with the gang for an hour's work or more in addition to their first duty of track walking and bolt tightening. On one of these roads no nut locks of any sort were used. While it is not claimed that the sole cause of rail end failures is loose bolts, it is claimed that directly and indirectly loose bolts form the chief primary cause of such breaks as well as of failures of splice bars. The apparent cause of a rail failure is frequently not the primary cause. Split heads, mashed heads and broken balls at and near rail ends, as well as breaks through bolt holes, are all very largely the results of poorly maintained joints, and in the last analysis the loose track bolt is found to be the original cause of damage.

It is no more sufficient to tighten all track bolts twice a year or twice a summer than to mend a dirt road at such infrequent intervals; nor is it any more economical. A casual track inspection, almost anywhere in America, will convince the investigator that the multiplicity of track evils, curable by simply keeping all track bolts tight all the time, involves almost incalculable saving in track materials and in rolling stock repairs; that this economy also involves actual extensive saving in section labor and an immeasurable increase in safety. Yet, year after year, to the music of the rattling track bolt and the clicking rail joint, we ride and bump and scheme for betterments in this and that track device, for labor economies, for "Safety First."

The absence of track bolts in side tracks and even in main tracks is not always due to the carelessness of the section foreman alone. A break in track constitutes an emergency. It is the duty of any railroad employee in case of such an emergency to do all in his power to make it possible to resume traffic quickly. When this emergency is past, when trains can get over a temporarily repaired track, permanent repairs are left to the track department. Too often this means that a section gang of two to five men and a foreman must put in many hours' extra work to get the track in safe condition for trains at usual speed. In consequence, cut rails are drilled with one hole only to begin with. When permanent repairs are made the drilling of additional bolt holes, being a small matter, is neglected and forgotten; or drills that should have been available have been sent to the shop for repairs and not returned; or, having drilling machines, no bits are on hand. Many cases have been noted where track men could not get bolts to fit the rails and splices in use on certain tracks. Likewise there are cases where bolt holes are so worn that large-sized bolts are necessary to fill the rail holes, but unusable because too large for the new splice.

In this connection the manufacture of track wrenches is a matter vital to proper results. The jaws of track wrenches are subjected to sudden and severe strains. If made of soft steel, or if made from improper patterns, these wrench jaws are easily spread, worn or broken. If the nuts or track bolts are of soft steel, the corners (especially of hexagonal nuts) are soon worn so that the wrench slips and will not turn them. There seems to be a field for improved methods of tightening track bolts. If ballast can be tamped with compressed air tools why should not power drills be used for drilling holes in rails for track bolts? There is on the market a remarkably efficient power drill for this purpose, operated by a belt-connected portable gasoline engine. But what seems to be needed is a power drill that can be operated readily from the motor section car engine. Such a tool would lighten the work of a section gang and allow many hours per week to be given to other maintenance work. This matter of full bolting and of keeping track bolts tight is of such importance in its bearing on the economics of track maintenance that it is well worth while for officers to know that track gangs are kept supplied with the best

of tools and enough materials to keep rail joints in the highest state of efficiency.

Old adages are old because human nature heeds not even that greatest teacher "Experience"; because axioms must be repeated constantly, must be "rubbed under the skin" day after day and are yet unheeded. Is it too much to hope that some time in the near future the Safety First sign may be rivaled by the display of a sign reading, "Keep All Track Bolts Tight All the Time"? And that the Safety First campaign may be supplemented by a campaign for continuously tight track bolts? It is suggested that as a start all maintenance of way department stationery be stamped, "Keep All Track Bolts Tight All the Time"; that all railroad track men be required to heed this rule, to keep on hand and in good condition the tools and the materials needed and to perform the necessary work promptly instead of delaying it to the detriment of the service, as has been done and is now being done so generally. Obviously this reform must begin at the top.

American methods which seem extravagant are frequently excused to Europeans on the ground that "conditions here are so different" that we cannot afford the expenditure of the time or valuable labor to make small savings which in Europe look, and are, large and truly economical. Here, then, is a detail which requires no extra material or extra labor, even to start. It requires only the determination to do, to carry on; the persistence of common sense in management.

UNSCRAMBLING THE RAILROADS

A BIRDSEYE view of our experiences in government control was recently presented at the annual dinner given by the famous Gridiron Club of Washington, D. C., through the medium of brief skits or acts which "gridironed" many topics now occupying the attention of the public. The parts of the actors were taken by members of the club, principally Washington correspondents, and in the case of the railroad skit entitled "Unscrambling the Railroads," they represented William G. McAdoo, former director-general; Director-General Walker D. Hines, and an investor. The "gridironing" was as follows:

McAdoo—"The late Mr. Hogan said that you cannot unscramble scrambled eggs. He was wrong. By the exercise of a little magic, to which we modestly lay claim, we shall illustrate how the railroads of the United States may be scrambled and then in the twinkling of an eye, as it were, and so to speak, unscrambled again. Can anyone loan me a silk hat? I shall return it promptly and entirely undamaged."

(Man steps forward with silk hat. He is Mr. Investor, a well-known citizen.)

McAdoo—"I shall return it with its pristine beauty untarnished."

Investor—"Please be careful. That hat represents the sale of a Liberty Bond."

McAdoo—"Tut, tut—have no fear—we shall not hurt it in the slightest. I shall break this egg into the hat—so—" (breaks and drops egg and shell into the hat).

Investor—"Oh, my hat!"

McAdoo—"Tut—tut—sir. Have no fears. Trust me. Kindly turn your back. What you don't see won't annoy you. Now we take another egg and break it—so. Now we take some flour—add some coal—pour in some of this agreeable variety of ketchup—add a little sand—and finish with a dash of vinegar. Please don't groan, Mr. Investor. It is all right. All these ingredients are symbolic, gentlemen. Now we have the roads scrambled. This completes my part of the trick. I shall now pass the buck—I mean the hat—to my friend, Mr. Hines, who will, in his magic way, with a few passes produce the beautiful rabbit known as government operation and control, and return the hat undamaged to my good friend, Mr. Investor." (Investor groans.)

Hines (looks and glares at McAdoo)—"I am deeply indebted to Mr. McAdoo for his trust and confidence. I wish he had finished the trick. He hates the limelight and likes to retire, while the retiring is good. But to the trick, gentlemen. Let me first cover the hat for esthetic and olfactory reasons. It is a little messy." (Covers hat with handkerchief, seizes wand.)

Hines—"I now make these mysterious passes—so—saying the cabalistic words—Hocus-pocus—1920—Brotherhoods—As Taught Me by Mr. McAdoo. Then I quickly raise the cloth and there we have—" (starts back, looking nervous). "Ah, I see, Mr. McAdoo forgot something. Let me add the Plumb plan." (Drops three plumbs and breaks another egg. Investor groans and tears his hair.)

Hines (continuing)—"Now we have it. Hocus—pocus—1920—presto." (Takes up handkerchief, looks—starts back, rushes to McAdoo, saying):

Hines—"My God, Mac, I can't do the trick."

McAdoo—"That's your affair—not mine."

Investor—"My hat, my hat!"

McAdoo—"Give him back his hat."

Hines—"But this mess—what will I do?"

McAdoo—"Oh, hand it back. He can't kick."

Hines—"Here you are, sir." (Hands hat to Investor, who takes it and yells):

"Investor—"What a mess! Oh, my hat! I can't use it. I can't clean it. I can't sell it. I can't give it away."

McAdoo and Hines—"Take it up to Congress. They'll fix it for you." (Both link arms, bow and go off.)

SECTION FOREMEN AND THE NO-ACCIDENT DRIVE

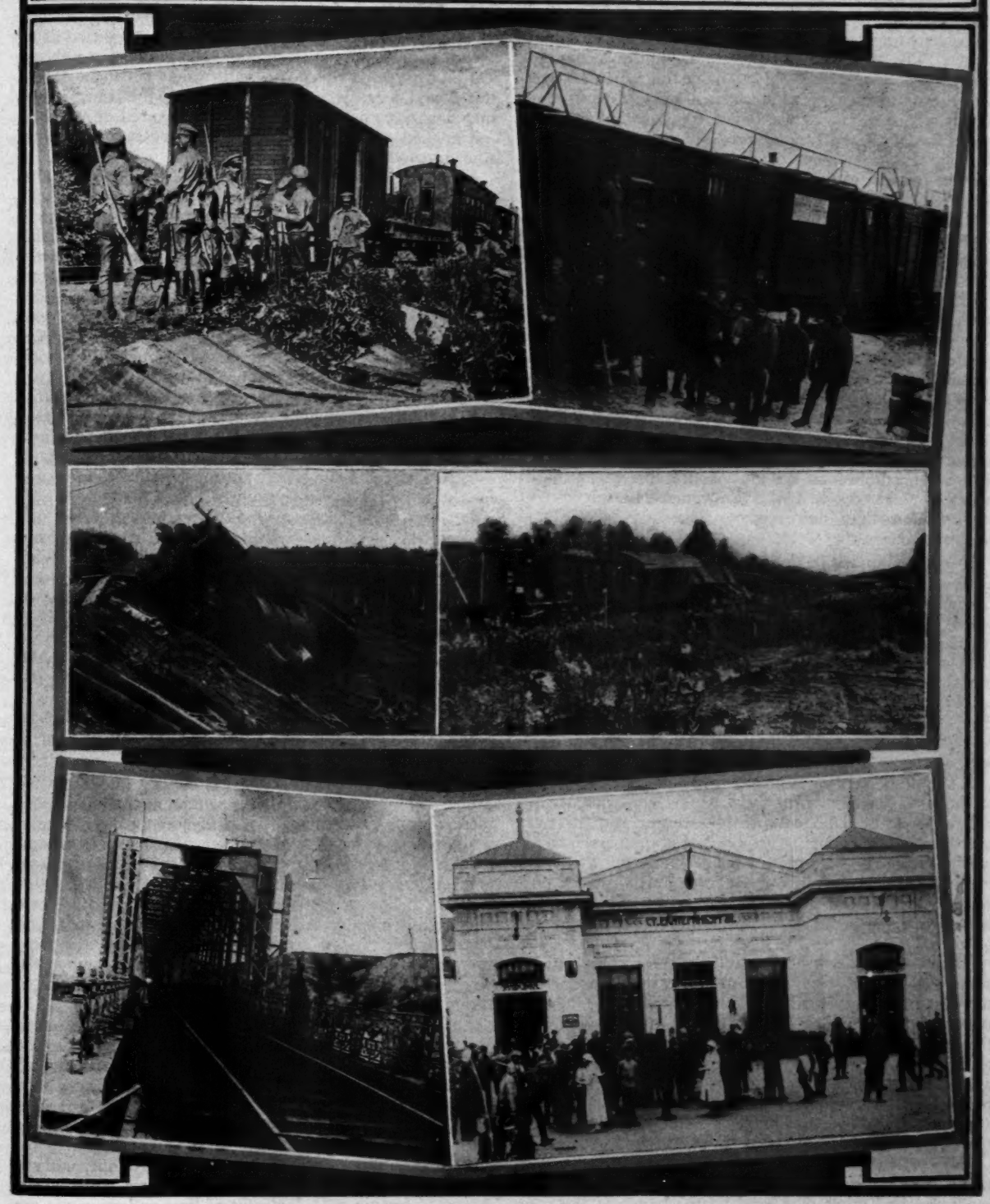
THE TUCSON division of the Southern Pacific finished the national No-Accident drive with a clear record. According to the Southern Pacific Bulletin, issued by that road, much interest was shown by all the employees in making a perfect score. Illuminated charts were placed at various points and at the entrances of the shop grounds before which the employees would gather during the day and night to note the progress made and to discuss the division's standing in the drive.

The roadmasters were confronted with an exceptionally hard task, as rail was being unloaded by hand on their districts during the period of this drive. Various methods were followed by them to surround the laborers with conditions more conducive to safety and this was accomplished largely through the co-operation of the section foremen. As 90 to 95 per cent of the Mexican laborers working on this division are indifferent to safety suggestions, it became necessary for the foreman to watch out for his men and oftentimes to do the actual thinking for them. The extra gangs for the greater part of the drive were laying 90 lb. rail, all of which was handled by hand. Both the section foremen and the extra gang foremen were carefully picked and instructed as to the safe handling of their men for whom they were responsible in that their gangs should keep a clear record.

The premises of all sections were kept clear of paper, material and rubbish and all tools were kept in good repair or condemned as unsafe. Personal interviews were had from time to time with each foreman and the necessity of a perfect score during the drive was carefully explained to them. In this way the safety-first principle was always before the foremen and the men and it was because of their appreciation of this and their interest in the drive that the 100 per cent record was obtained upon the Tucson division.

Passenger Station at Consolacion, Cuba

Railroading Here and There



SCENES ON THE TRANS-SIBERIAN RAILROAD

Czecho Slovaks Guarding the Line
Locomotive Derailed by Bolshevists
The Railway Bridge Connecting Omsk with Kolomzeno
A Sanitary Disinfecting Car
Scenes of Ruin and Decay Along the Railroad
Station in the Town Where the Czar Was Assassinated

TREATING WATER WITH BOILER COMPOUNDS

A Discussion of Materials that Have Been Used for this Purpose on Locomotives and Stationary Engines

THE TREATMENT of water in roadside tanks to remove materials detrimental to its use in the production of steam in locomotive boilers is distinctly a problem for the engineering and maintenance departments. The treatment of the water in the locomotive boiler to remove these objectionable ingredients comes within the province of the mechanical department. Since it may be necessary to use boiler compounds where the water has not been treated properly before delivery to the engine, the methods of the two departments bear a distinct relation to each other. It is for this reason that we present the following information concerning the use of boiler compounds to the readers of the *Railway Maintenance Engineer*. The following article is abstracted from a paper presented before a recent meeting of the Western Railway Club, Chicago, by W. S. Mahlie.

The question of treating boiler feed water has been one of the most neglected items in railroad operation. The problem of economy and efficiency looms up with greater importance each day. The saving of fuel, the cost of which is no small portion of the operating expenses, has been very forcibly impressed upon railroad men. Outside of actual wastes in poor coal, insufficient combustion, etc., one of the important factors of fuel conservation rests upon the quality of the boiler feed water. In addition to the loss of fuel due to untreated water, there is the cost of the locomotive being out of service, new flues and reboxes, labor in calking and washing boilers.

It is not intended in this article to convey the idea that all feed waters should be treated with boiler compounds. By far the most of them should be treated in a regular water treating plant. The cost of treating water by the regular plants and by boiler compounds should be carefully compared and the results obtained from these treatments should also be studied. Boiler compounds are not to be regarded as absolute cures for all boiler troubles. They seldom do more than lessen the bad water conditions, the extent of which depends upon the original water and, of course, the compound used.

It should be kept in mind that a steam boiler was made to furnish steam; not to treat water, consequently the boiler should be supplied with good water so that it can perform the duty which is required of it. A person would hardly drink typhoid-germ-laden water and then take medicine to prevent typhoid, but rather would use a pure water which would not produce disease. So it is with boiler waters; an ounce of prevention is worth a pound of cure.

Boiler compounds are of many different compositions, some good, some bad, some indifferent. Viewed with the eyes of the practical water purification man, they are regarded as patent medicines. Like patent medicines, they are much advertised and all sorts of good and bad testimonials are recorded following their use. All boilers are not alike, neither are all boiler waters. For this simple reason no compound can be developed which is a sure cure for all boiler troubles. Some may be good for one thing, some for another.

In view of the many compounds sold, it has been undertaken in a general way to show their classes, possible reactions, and other data, and let the buyer of the compound judge for himself as to their merits.

A successful boiler compound must fill the following requirements: (1) It must make the water non-corrosive. (2) It must hold in suspension, or colloidal form, all of the salts which would give rise to an incrusting precipitate. (3) It must put the water in such a condition as to keep it from foaming or priming. (4) It must be a chemical or compound of such a nature that it can be safely stored and kept from deteriorating. (5) It must be of such a nature that it can be easily measured or weighed and applied. (6) Its cost must compare favorably with other methods of feed water treatment.

Compounds are generally used for either one or more of the three following purposes. First. To remove and prevent scale. Second. To prevent corrosion. Third. To prevent foaming. Only compounds of the first and second kinds will be considered here because, strictly speaking, the third kind are not boiler compounds, but anti-foaming compounds.

The boiler compounds may be roughly divided into three classes: 1. According to chemical action. 2. According to mechanical action. 3. According to combined chemical and mechanical action. In the following discussion the terms temporary hardness and permanent hardness will be used, denoting respectively the bicarbonates of lime and magnesia; and the sulphates, chlorides and nitrates of lime and magnesia. The term incrustants is usually applied to the latter, but most practical men prefer the term permanent hardness.

Compounds Depending on Chemical Action

Soda ash or *sodium carbonate* is used more than any other chemical and is the base for practically all boiler compounds. Soda ash usually runs about 98 per cent pure sodium carbonate (Na_2CO_3). Another form known as soda crystals runs about 34 to 35 per cent (Na_2CO_3), the balance being water of crystallization.

The action of soda ash in the boiler is the same as in the regular treating plant outside the boiler. It removes the hard scale or permanent hardness, and neutralizes acids which cause corrosion. Too much soda ash should be guarded against, as it will cause foaming when used in excess.

Sodium silicate or *water glass* is coming into extensive use as a boiler compound. It is seldom applied alone, but most always in combination with soda ash or tannin. Sodium silicate has the advantage of acting on both temporary and permanent hardness. When sodium silicate acts on temporary hardness one part of soda ash or sodium carbonate is liberated for each part of silicate added; this sodium carbonate is then available to act on permanent hardness. In using sodium silicate the same precautions should be used as in all sodium compounds, since excesses cause foaming. Sodium silicate comes to the market in liquid form.

Sodium hydrate or *caustic soda* is not used as much as formerly, when it had quite an extensive use. Caustic soda acts on both temporary and permanent hardness and neutralizes acids. Like sodium silicate in its action on temporary hardness, each part of it liberates an equal amount of sodium carbonate available for action on the permanent hardness. Caustic soda is not available for removing sulphates of lime and magnesia alone, without the presence of enough temporary hardness, since by the action of caustic soda, hydrates of lime and magnesia are formed.

An excess of caustic soda is probably one of the worst

things to get into a boiler, because, like other soda salts, it causes foaming, and has a decided action on brass valves and fittings. Caustic soda is bad material to handle, since it takes up water very readily from the air and burns the skin and clothing. Caustic soda is sometimes mixed with soda ash and is known as Special Alkali. The approximate composition of this material is 40 per cent caustic soda and 60 per cent soda ash.

Tri-sodium phosphate was formerly used to a great extent, but is not used so much at present. It is distinctly a boiler compound since the reactions between lime and magnesia compounds are not complete at ordinary temperatures, but the water must be boiled in order to obtain the maximum effect. Like the silicate and hydrate of sodium in its action on temporary hardness it liberates an equal part of sodium carbonate, which can be available for further action.

The di-sodium has also been used as a boiler compound. The precipitates or sludge obtained from the action of the phosphates are very light and flocculent, and are easy to blow out of the boiler. It is claimed by some that sodium phosphates are the most efficient boiler compounds in use.

Sodium chromate can be used to precipitate lime compounds, temporary and permanent. Another peculiar property of chromates is that they render iron passive to corrosion.

Sodium borate or *borax* has been used to some extent as a boiler compound. Lime compounds are precipitated cold, as borates, but magnesia compounds are only precipitated under the heat of the boilers.

In all the preceding discussion, sodium compounds only have been considered. It should be remembered that potash compounds will act in a similar manner, but owing to the high price of potash compounds they are not used for this purpose.

Barium Salts. In many respects the barium compounds are the ideal boiler compounds, since no soluble alkaline salts are left in solution by their use. On the other hand, their cost is much greater, due to the larger amounts required for reactions, and also to the increased cost per pound compared with an equal weight of sodium compounds. In addition, barium salts are poisonous and consequently are not desired, even around boilers, where anyone might accidently drink some of the water. Barium salts are ideal for incrusto-corrosive waters having high sulphate content, which otherwise would cause foaming by treating with sodium compounds.

Lime. Lime reacts on the free acids, temporary hardness and magnesium compounds. The introduction of lime, however, adds a very bad feature to the acid waters, inasmuch as it will give rise to an extremely hard scale, and the acid is only removed or neutralized at the expense of adding hard scale to the boiler.

Lime comes to the market in two forms, the lump or quick lime, and the hydrated lime. The lump lime is usually the cheapest and an equal weight of it is more efficient than the hydrated lime, since the hydrated lime contains about 25 per cent of combined water. The lump lime, however, becomes air slaked on exposure to air, and is then useless for water softening, while the hydrated lime does not slake. Lump lime runs about 88 per cent pure. When only small amounts of lime are used, the hydrated is probably the best to use, since it can be stored and does not slake. Lime acts on all free acids, on temporary hardness and on magnesium compounds.

Tannin Compounds and Wood Extracts. Tannins are used as scale preventives in boilers. They are distinctly boiler compounds, and precipitate lime and magnesium as a light bulky precipitate. Tannins are seldom used alone, usually combined with sodium carbonate, sodium hydrate or sodium silicate. Tannins are obtained from a great many sources, some of them being hemlock bark, oak bark, Canaigre, Quebracho, Palmetto root, Catechu, Gallnuts, Sumac, Valonia and Divi-Divi.

When tannin is used it leaves a very light friable deposit, which is easy to remove. It is claimed that tannins are among the safest and best materials to put into a boiler. Some persons object to tannin, claiming that it will cause corrosion. No cases of such action, however, have been brought to light. The different bark extracts are mixtures of tannin and other closely related materials which act in a manner similar to tannin.

Sugar and Molasses, Glycerine. It has been claimed that sugar, molasses and glycerine are good scale preventives, that tfiey dissolve the lime and magnesia salts and hold them in solution, thus preventing a deposit. But a series of scientific experiments have proven the fallacy of using sugar and molasses for this purpose.

COMPOUNDS DEPENDING ON MECHANICAL ACTION

Clay. De La Coux* says: "Clay is a fairly good scale preventive, but there is danger of it working into the machinery." It would appear to be a rather peculiar proceeding to add clay to boiler water, because most boiler waters contain clay and other suspended material which it is desired to remove.

Talc, powdered limestone or chalk, pumice and *ground glass* would all act in a manner similar to clay. No advantage can be seen in the use of any of these since they all are inert chemically and they are not of a nature which would benefit scale by being incorporated with it.

Graphite. Literature on the use of graphite as a boiler compound is very scanty. After a thorough search, numerous instances were found where graphite was used, but no record of the results obtained were shown. Graphite cannot be used other than from a mechanical standpoint in removing scale, since it is inert at ordinary temperatures. The producers of graphite say graphite will not act chemically, but when the scale is deposited the graphite intermingles with it and prevents it from becoming a compact mass, and keeps it soft and easy to blow out. They also say that the graphite will work through the accumulated scale to the tubes and shell of the boiler and loosen the deposited scale. It is doubtful whether the graphite will do this, but if the graphite were coated on the inside of a new boiler, it would prevent much scale from adhering to it.

Starch, Glucose, Dextrine, Potatoes, Slippery Elm, Artichokes. Any number of materials of a similar character have been proposed. Their action, if any, is entirely mechanical. It is claimed that these substances dissolve in the water and form a sort of gummy gelatinous coating around the grains of deposited scale and prevent them from sticking so tightly together.

Dextrine, starch and glucose are more frequently used as binders in boiler compounds to hold the different constituents together, either in the shape of a ball or a brick.

Ground hoofs and *horns* have been used to prevent scale. When boiled these would yield glucoses and gelatines which would act as before stated.

Oils. The addition of oil to a boiler to prevent scale has been practiced for a long time. The action, of course, is entirely mechanical. Several explanations as to the action have been made. Some say the oil "rots" the deposited scale. Others say the oil envelopes the precipitated scale and prevents it from sticking. Others say the oil is attracted to the hot tube, becomes overheated, and forms a tiny explosion, which breaks or knocks off the deposited scale. The benefit of oil addition appears to be questionable.

Fats. Fat either alone or mixed with other substances

*"Industrial Uses of Water."

has been proposed and used. It was probably the intention to coat the inside of the boiler with a coating of grease to prevent the particles of scale from adhering to the inner surfaces. No cases have been found recorded where this was entirely satisfactory.

Rosin and Tar. Rosin has been used in a manner similar to fats. When tar was used it was mixed with five parts of oil before being applied.

Before going into the use of a boiler compound on a large scale, the composition of the compound should be ascertained, and its value in removing the scale and acid materials should be determined. The cost of the compound should be compared with the cost of treatment with lime and soda ash in a regular treating plant. The labor in applying the compound should also be compared with the labor of operating a regular treating plant.

Wholesale Prices of Chemicals in Effect January 1, 1919.

Lime, 88 per cent	$11.05 Ton
Soda Ash, 98 per cent	58.60 Ton
Caustic Soda, 76 per cent Na_2O	4.15 Cwt.
Sodium Phosphate	0.04 Lb.
Sodium Silicate, 40 deg. Baume	0.02 Lb.
Barium Hydrate, 54 per cent	0.18 Lb.
Barium Carbonate, 97 per cent	65.00 Ton
Barium Chloride	70.00 Ton
Borax	0.08¼ Lb.
Tannic Acid (Commercial)	0.65 Lb.

In all cases lowest quotations are given.

It should also be remembered that when using a boiler compound, the only way in which the scale can be removed is by blowing down. Blowing down wastes water and steam which has been brought to boiler temperature at the expense of coal.

Mexican Laborers Respond to Bonus System

BY W. C. NISBET

MAINTENANCE officers on southwestern roads employing Mexican labor may be interested in the way the work of laborers of this nationality was affected when they were placed on a wage basis with fixed day wages plus an increasing bonus as they approached a certain standard output of work. Mexican laborers as a class have a reputation for working at a very leisurely pace; some of them are wonderfully skilled in all the arts of loafing. In one instance a street railway track laborer in a southwestern city was watched for 15 min. and in that time he took but three shovelfuls of dirt from the roadbed he was supposed to be digging out, the rest of the time being spent in elaborately getting ready, in watchful waiting, in examination of his shovel, and in getting out of the way of four street cars which passed during the period.

Further, there is a widespread belief that more earnings than enough to live on do not appeal to him. Hence it was with some hesitation that bonus was applied to such workers at the plant in question. This plant was a combination of quarry and mill engaged in the production of an insulating and filtering material from diatomaceous earth, employing 400 men, of whom 300 were Mexican laborers. It was located near the coast, 150 miles north of Los Angeles, and all the labor had to be recruited from that city. The excessively high labor turnover and the poor class of labor received made it almost imperative to effect an improvement, but to do this it seemed necessary to offer larger earnings, which in turn was undesirable unless a reasonable return for increased wages was insured in the shape of an increased output per man.

These conditions brought about the adoption of the bonus system, such as is familiar to many readers of the *Railway Maintenance Engineer* as that in use in the Baltimore & Ohio prior to government operation. Standards were set for different operations, such as so many hours per ton of rock quarried, so many hours per thousand brick sawed or packed or loaded in cars, or for so many tons of rock ground.

In the quarrying of the crude rock and in other schedules the standards were for a group or gang of laborers, including (a) the foreman, who received a certain rate; (b) quarrymen, who were paid a different rate, and (c) wagon loaders and other laborers, who received still less per hour. All shared in the bonus earned, in each case the individual bonus being a percentage of the wages earned and this particular percentage being determined by the relation between the standard hours for the task and the actual hours consumed in doing the work in practice.

When the bonus schedules were approved by the superintendent they were translated into Spanish and posted and were also explained to the men by the Spanish-speaking employment superintendent. The Mexicans had very little to say at first, except among themselves, where the whole affair was termed a "Yankee trick." Later when at the end of the first pay period of reasonably improved endeavor, with two pay checks, one for their regular wages and the other a "Bono Check," as they called it, amounting to a sum of from $1 to $3, they appeared excited and from that time on production increased. At the coming of the winter rains, when the regular quarrying operations stopped, the production per man had increased exactly 50 per cent, and for this the bonus payments were amounting to from 30 per cent to 40 per cent. Another favorable result was that fewer men were required, as each individual did more, hence less housing and living accommodations were required.

The character of the labor work was about on a par with track work as far as skill and ability were concerned. The manual work was moderately laborious. Undoubtedly a part of the improvement in output was due to closer supervision of methods, tools, etc., and to attempts to teach foremen and men easy, quick methods of work, all this being a part of the general campaign to accomplish more work with fewer individuals of higher type and better paid than was the case previously. The foremen, being able to increase their earnings by larger output, were stimulated by frequent admonition to plan their work better, and to take advantage of all possibilities. This had its effect as well.

In the brick mill where large rectangular blocks about 42 in. square and 18 in. thick were sawed up into standard size brick, the 22 men engaged were on a gang standard. Their work was to place the blocks on cars and after the various passes through the saws, change the position of blocks or feed the separate swing saws, and they worked extremely hard and fast. Some of these men worked harder than any laborer should work continuously. There was a small department called the sack room where second-hand sacks were mended by hand. In the past this disagreeable work was done at a very leisurely pace, but after the bonus had been in effect a few weeks the output per man was doubled.

The Mexicans at this plant were recruited from many sources. A few were California born and could speak

English, but most of them were ignorant of that language and came from all along the border. Some were Indians lately from Mexico. The majority had little knowledge of American methods.

The only department where the bonus failed to stimulate the work was in the brick quarry where the above-mentioned large blocks were excavated. There were about 45 men engaged in this work, and as at first it seemed difficult to separate the work into small units, the whole groups were placed on one standard, so many bricks per day. As might have been foreseen, the reward was too remote to be affected by the work of single individuals and the increase per man was insignificant. This work will have to be divided up into smaller groups working on separate standards to be effective.

In several instances where in a small gang one or more men were slow or lazy, the rest objected and asked the foreman to dispose of the slow workers.

There were one or two important particulars wherein the Mexicans acted differently from Americans or other nationalities. One was the suspicious nature of the former, causing them to appear to disbelieve for a time whatever was told them and only to accept a statement after tangible results appeared. It appears necessary to take special pains to reassure them, and in this feature, as in many others, a person is needed who can speak Spanish fluently. It is not enough merely to be able to give orders.

Another characteristic, evidently racial, is that of being easily discouraged. If a gang ran into difficulties, and the output or bonus fell off, it would be several days before they got up to their former pace.

It may be asked if the men quit as soon as they had made a stake with their increased earnings. As a matter of fact, the labor turnover decreased and the money was largely spent at the company commisary for clothing, pool playing, fruit, pop and sweets.

To conclude, this observation, lasting over a year, made it clear that these ignorant and usually lazy workers of simple tastes and speaking almost no English were stimulated quickly to an exceedingly good day's work by being able to make increased wages for extra effort.

Some Substitutes for Linseed Oil*

BY A. H. F. PHILLIPS,
Master Painter, New York, Ontario & Western, Middletown, N. Y.

THERE HAVE been great demands for linseed oil and some specialists predict that the call for seed to fill the large contracts will become so urgent that higher prices will eventually be realized. If such is the case, it will mean an almost prohibitive price for use in railway painting. There has been a general shortage in flaxseed which still continues; the Canadian and American supplies remain light, and Argentine conditions have not changed particularly. American buyers have been credited with considerable stock in warehouses, but receipts and available supplies are somewhat limited, with prices and freights high and cargo space at a premium.

For some time past the railways have been receiving many paint oils as substitutes for linseed, but I believe there is none, as yet, equal to it as a paint-making oil, although a paint oil for use on a railway can be made and is being made and sold by many companies with a linseed oil base, and of the same gravity. This dries with a good gloss, as it contains enough volatile oils as conveyers to assist materially in the application of the paint, and, when evaporated in drying, leaves a thoroughly elastic and highly protective oil film in combination with the pigment. This paint oil can be used in thinning out paints of any character, oxide, carbon, lead or zinc, where oil is desired as a thinner, without danger of any chemical action. Such oil should probably be called a combination oil.

Vegetable oils, such as cottonseed oil, soya bean oil, hempseed oil, corn oil, peanut oil and cocoanut oil, are used by many in making up their paint oils. These vegetable oils, being largely food oils and used extensively in paint-making as substitutes for linseed, have found an increasing market. Mineral oils are also used to some extent, but I do not think it advisable to be too free in the use of them.

OILS OTHER THAN LINSEED USED IN PAINT

There are quite a number of these drying, semi-drying and non-drying, and not a few have their special uses in paint. The most important of the drying variety is Chinawood oil or tung oil. Poppy seed oil is prominent for grinding the finer grades of zinc white and artists' colors, and must be classed among the drying paint oils for the reason that when pressed from ripe seed it dries very nearly as rapidly as raw linseed oil. The reason for the use of poppyseed in colors or paints is due to the non-darkening of this oil and its free spreading. Bombay nut oil was at one time largely offered at a price somewhat lower than poppyseed oil. It was very clear, almost water white, and its drying property is fully equal to that of bleached linseed oil. However, this oil has not been heard from in the market for some time.

Sunflower seed oil is also classed among the drying oils, but it has not found its way into general commerce, and, therefore, nothing more is known about it than has been ascertained in an experimental way. Hempseed oil also belongs to the class of vegetable drying oils, but this seed, being raised principally in Russia and a few other localities in Europe, is used mostly there as a paint oil, and if any is brought to this country it comes as an admixture with linseed oil. Another vegetable drying oil that has been largely imported into this country and Europe for some time, under the name of candle nut oil by soapmakers and known to science as Kukui oil, is now being tested by varnish and paint manufacturers. It bids fair to be a strong competitor of linseed oil when its characteristics become better known to the trade and when it is prepared in a more scientific manner. Other drying vegetable oils, as niggerseed oil, tobacco seed oil, Scotch firseed oil, etc., that are not readily obtainable in commerce, are not interesting to the paint maker and color grinder.

Another oil, which is of animal origin, is the fish oil known as Menhaden oil. This is barred from use in many paint materials, especially in interior paints, because of its offensive odor, and is made use of only in special outside paints, such as roof paints and stack paints, and by some manufacturers in other specialties.

Among the substitutes for linseed oil that interest paint manufacturers most should be classed soya bean oil, corn oil and cottonseed oil. Soya bean oil requires fully ten

*Read before a meeting of the Master Car and Locomotive Painters' Association at Chicago.

days to dry to a film and then the film will not be as firm as that of raw linseed oil, which requires only about six days.

Since linseed oil is extraordinarily high priced there is quite a demand for bean oil and it is quite a task for paint-makers to discover methods to make their products dry in the ordinary way. The usual practice is to use equal portions of soya bean oil and boiled linseed oil, or when this will not work out well the bean oil portion is increased and also the driers.

Corn or maize oil has been in use in paints for many years, but is made use of only when linseed oil is high in price. This oil has very little, if any, drying properties, and will harden to a brittle and rather mealy film in from 20 to 30 days. Cottonseed oil has no drying properties, but is a good lubricant, and, previous to its rise in price when it came to be used as a cooking and table oil, it was used to adulterate linseed oil. Rosin oils are not only used in printing ink making, but were largely employed in making paint for rough surfaces, though, since their price has advanced to twice and even three times their former cost, they have been replaced by mineral paint oils to a great extent in paint. Rosin oils are practically non-drying, and, while they harden in time, they will soften again under the influence of sun heat and cause the paint film to part or alligator. Pine oil and tar oil are products from the distillation of wood spirits and of rosin, and are used in the manufacture of marine paints, especially paints for ships' bottoms. These oils are considered semi-drying and water-resisting to a certain degree.

Mineral paint or paint and putty oil, as it is called among the trade, is refined petroleum or neutral oil, so named because debloomed. These oils cannot be used without being mixed in certain percentages with boiled linseed oil, as they lack binder and are apt to wash off the surface in driving rains. Even when used in large portions in a liquid paint for rough surfaces such paints have been known to wash off when they were supposed to have dried hard a month or two before. Petroleum products of this class will sweat, causing softening of the film and consequent damage by water.

Cheap paints for use on rough lumber or other rough surfaces can be made by grinding the base in linseed oil (usually boiled), thinning with a mixture of about 35 gal. of gloss oil (rosin and benzine mixture), 10 gal. of raw linseed oil and 5 gal. of liquid drier; or if it must be still cheaper, a thinner can be made of 30 gal. of gloss oil, 15 gal. of debloomed neutral paraffin oil and 5 gal. of lead and manganese drier. In any case, however, the pigment to be used as the base for the paint should be ground in linseed oil.

So far linseed oil has not found an equal in paint-making, although the subject has been one of deep study, and while other fixed oils have been discovered that were expected to take its place for certain purposes, it has not yet been demonstrated that such is really the case in long practice.

Chinawood or tung oil, while superior to linseed oil for certain purposes, especially in resisting the effect of water, has not shown itself adapted to replace it in making oil paints as we know them and desire to use them.

When linseed oil that has been placed on a strip of glass painted jet black, shows a bloom or iridescence, it is adulterated with mineral or rosin oils. Admixtures of linseed oil and corn oil or linseed oil and cottonseed oil can be detected by placing some of the oil between the palms of the hands, rubbing briskly and noting the odor thus emitted. The presence of soya bean oil, however, cannot well be ascertained by simple tests, and a chemical analysis is necessary, though even that is sometimes misleading.

SAFETY FIRST IN USE OF TRACK JACKS

By Walter B. Templeton
President, Templeton, Kenly & Co., Ltd., Chicago

AS A COMMON sense railroad necessity, "Safety First" has been quite thoroughly impressed on the minds of railroad employees and the public. There are, however, many opportunities for further progress. Track jacks have been given little attention in the rule books of the roads, and the purpose of this article is to set forth briefly a few of the more important rules governing safe use of jacks.

Flag Protection

Practically all railroads forbid the placing of track jacks between the rails where avoidable, but whether set inside or outside the rails the track jack is an obstruction to traffic which requires the display of proper signals. Therefore, unless absolutely necessary, they should not be used in weather which tends to obscure signals, but when necessity demands their use in blinding storms, or in hazy or foggy weather, extraordinary signaling precautions should be taken. Under usual working conditions caution signals should be displayed when jacks are placed outside the rails. When necessary to place jacks inside, as at passenger and freight platforms, switches, frogs and crossings, the track must be protected by flagmen.

When raising switches, frogs and crossings, where several jacks are used, the track should be protected by flagmen, for it is difficult to release the load uniformly and, further, it takes longer to do the tamping necessary to make the track safe for traffic.

Operating the Jack

In section work the jack lever should be taken out of the socket after raising the track. If left in place there is danger of a man tripping on the lever. In making tie renewals or replacements, the foreman should be certain all his men are clear, before giving orders to trip the jacks, otherwise some man's toes will get caught.

A track foreman should be on the alert for the approach of trains. The men should be ordered into the clear in ample time and all lined up on one shoulder. This enables the foreman to keep his eye on them and prevent anyone from starting to return when a train is approaching on another track. This definite routine in getting out of the way of trains will make it a habit to do the safe thing at the right time.

Taking Care of Tools

The proper mechanical operation of a jack is, of course, important as a safety factor. Oil should be used sparingly, as the trunnions are packed in grease and require only semi-annual lubrication. Once a week the pawl seats should be oiled and the plane surfaces of the rack bar swabbed with an oily rag.

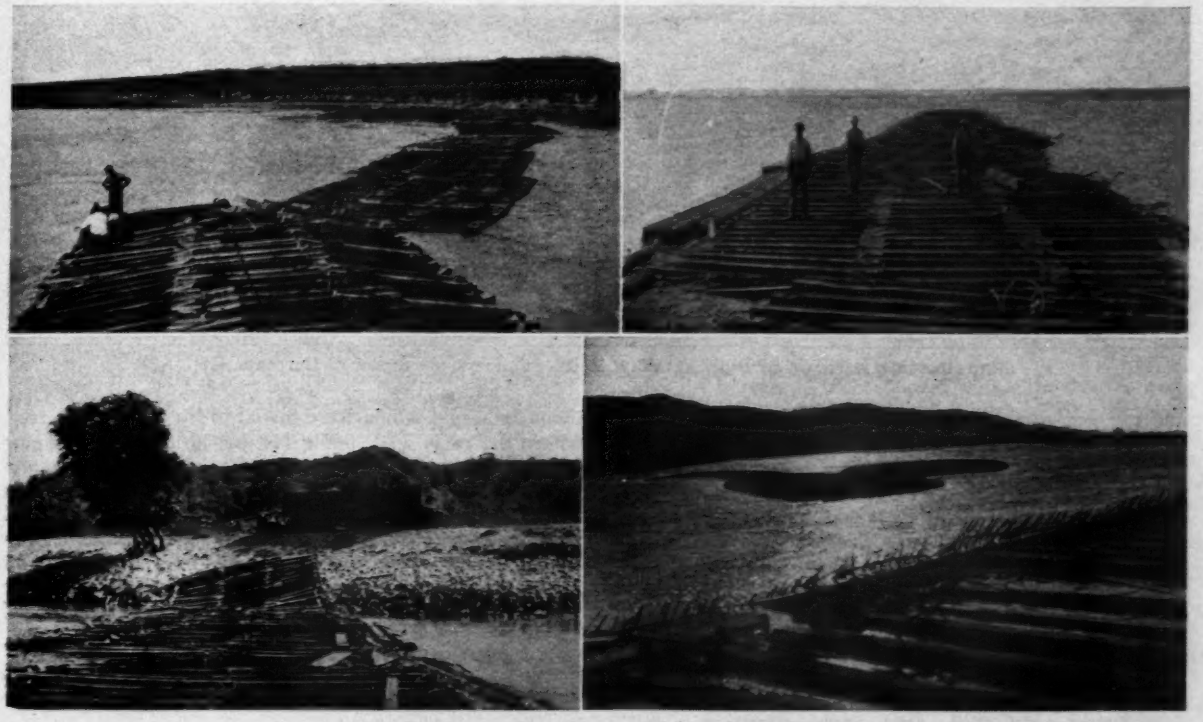
When men get out of the way of trains, jacks or any other tools should not be left between tracks, nor should they be left on piles of ballast beside tracks, as they may be struck by a train and hurled through the air, carrying injury with them.

Whenever track raising is discontinued for some time, the jacks should be carried out to the shoulder and laid flat, and where bars are used as jack levers they should be stuck in the ground beside them. If a man then trips over the jacks the worst he can get is a fall. If he trips on a jack between tracks he may fall in front of a train.

A New Type of River Current Retards

The Chicago, Burlington & Quincy Constructs Flexible Rafts to Protect River Banks From Cutting

THE CUTTING action of the Missouri river has long been a source of trouble to railroad engineers who have had to contend with it, and has resulted in the development of numerous ideas and projects intended to overcome the washing out of its banks. One of the more recent of these developments is that of flexible rafts designed and installed by the Chicago, Burlington & Quincy on the east bank of the Missouri river about 14 miles south of Council Bluffs, Iowa, on its main line between that point and Kansas City. While the bank along this part of the river is protected with mattresses, stone dykes and other forms of revetments, the severity of the current made it necessary to take further precautions. It is expected that in addition to rendering these installations more permanent, it will be possible to dispense with these types of protection in the majority of future installations with a resulting large saving in money. The cost of constructing and installing the rafts is comparatively small, the total expenditures for the Burlington project being approximately $14,000.



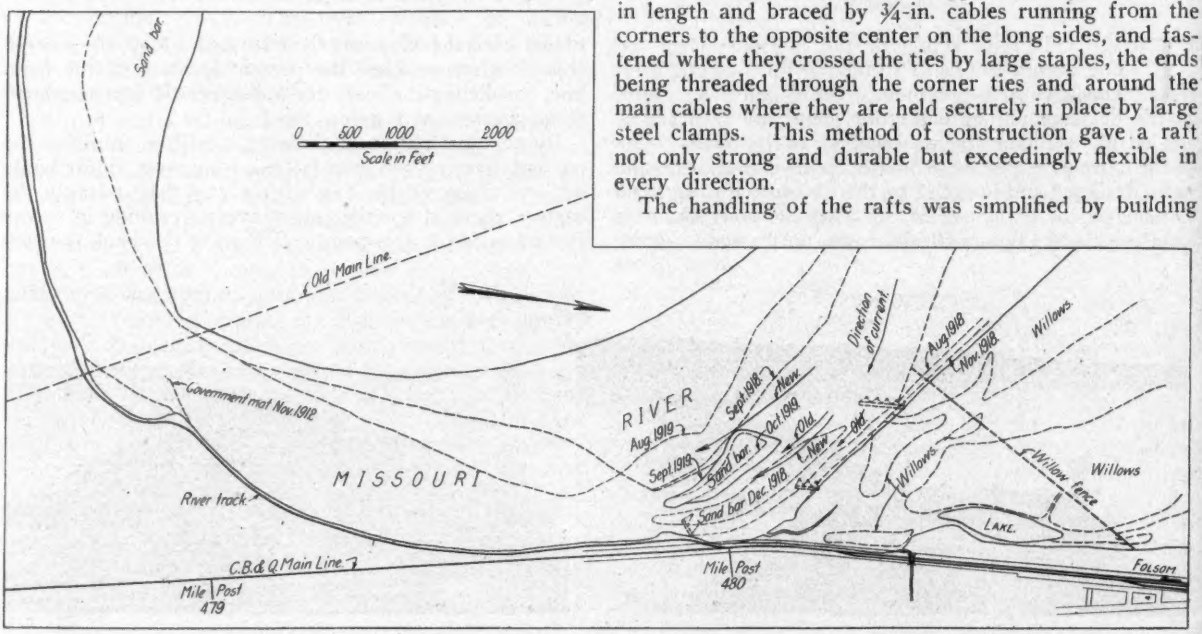
FOUR VIEWS OF THE BURLINGTON RAFTS

Bringing a Section Into Place — *The Raft Anchored in Position*
Shore End and Bank Protection — *A Bar Formed Below the Raft*

The old main line originally lay about one mile west of Folsom, the Missouri river being still farther to the west. In accordance with its well-known property of changing course, etc., the river gradually cut its way east until in 1885 it became necessary for the railroad to construct a new line and abandon the old one through this section. The new right-of-way was thought at the time of the change to be far enough away to be free from further action of the river current, but the cutting continued until the Missouri river formed a loop, the eastern end of which reached the present location of the main line, paralleling it closely for a distance of approximately three-quarters of a mile.

By an examination of the map it will be seen that the current entering the loop followed the west or far bank, but was deflected by it in such a way that it struck the eastern shore at a rather sharp angle, resulting in severe cutting action at this point. Following this bank the current became narrower and more swift, with resultant serious damage, until it had reached a point where it became necessary to take strenuous measures to prevent its further encroachment. Log rafts were anchored in position at points along the bank above mile post 480 and one edge sunk by unloading rock on them, while the bank itself was reinforced and supported by brush mattresses, stone dykes, etc. This seemed for a time to be holding against the action of the current, but on later examination it was found that the rafts and other types of retards had either sunk completely or so nearly so that they were doing but little good in deflecting the current. Along with this it was discovered that the original retards had first sunk at the center, causing the current to split at a point about 1,600 ft. up river from mile post 480, one branch extending along the shore, where it was rapidly cutting out the bank and creating a narrow channel varying from 20 ft. to 30 ft. in depth and about 250 ft. wide at its widest point. The other branch turned to the west, a sandbar forming between the two branches, which

would have had a tendency to fix the two currents in their respective courses unless the river should be able to cut its way farther east in the future. The resulting action of the inshore current proved to be serious and in spite of the best river bank protection that could be constructed, considerable undermining and inundation of the revetments at this point followed.

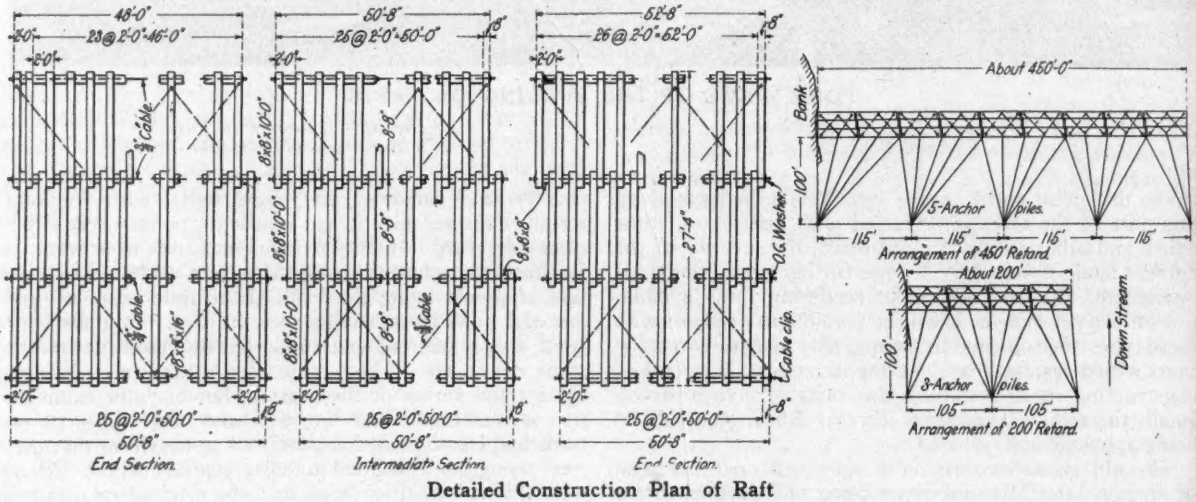


Map Showing Location of Right of Way, Rafts, Sandbars, Direction of Currents, Etc.

DECIDE TO BUILD RAFTS

Since the original installation of retards while partially afloat had been to some degree successful in depositing silt and thus forming bars along the shore, it was decided to expand this idea and build raft retards that would float under all conditions. The retards decided upon were built from 8-in. by 8-in. by 10-ft. pine ties with 1¼-in. holes bored 8 in. from each end. These ties were threaded on ¾-in. cable, of which four strands per section were used, thus giving a raft 27 ft. 4 in. or approximately three tie lengths wide, allowance being made for the distance from the ends for the holes. The ties were spaced 2 ft. center to center by using ties cut 16 in. long bored 1¼ in. the long way and placed between each tie on the two outside cables, with blocks 8 in. long of the same material on the two inner ones, the cable ends being pulled through heavy washers and held by strong clips at the ends of the section. The sections made were approximately 50 ft. 8 in. in length and braced by ¾-in. cables running from the corners to the opposite center on the long sides, and fastened where they crossed the ties by large staples, the ends being threaded through the corner ties and around the main cables where they are held securely in place by large steel clamps. This method of construction gave a raft not only strong and durable but exceedingly flexible in every direction.

The handling of the rafts was simplified by building them on barges which were towed to the location desired, where the rafts were made fast by ¾-in. cables running from the centers and joints to anchor piles, and the barges pulled out from under them, old boiler flues threaded on light cables being used as rollers. Bignell reinforced concrete piles were used for anchors, being jetted down until their tops were approximately 15 ft. below the river bottom, each pile holding two sections. The piles were spaced opposite the joint between every other section and on a line forming approximately a 45-deg. angle with the shore. A short section was also added to the shore end of each raft, which was fastened both to the raft proper and to deadmen ashore by means of cables, the idea being to increase the length of the raft so that with the advent of high water there would always be one end of



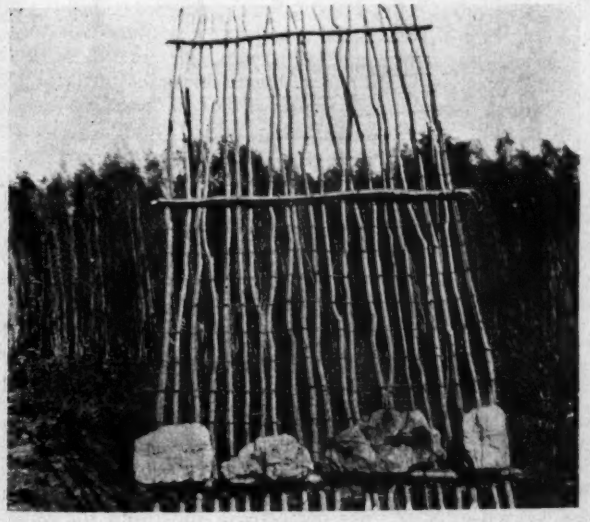
Detailed Construction Plan of Raft

the raft resting on the bank. As a precaution against the possible chance of current washing around the shore end, mattresses made from bundles of willows were sunk along the bank and riprap unloaded on them.

The completed installation consisted of three separate retards spaced along the bank approximately 1,250 ft. apart. The upstream raft, or raft No. 1, which was 450 ft. long and consisted of nine sections, was anchored to five piles, the shore end being about 2,200 ft. from mile post 480. Rafts No. 2 and 3 were each of four sections and about 200 ft. long, raft No. 2 being anchored slightly upstream from where the diverted or split current struck the bank and the cutting action was especially severe, while raft No. 3 was installed near a small point of land that was being rapidly undermined by the swift current of the river, the channel being narrowest at this particular spot.

WILLOW APRONS

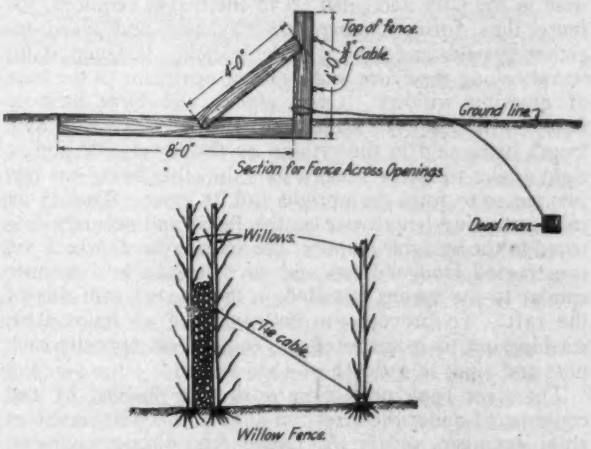
The actual retarding of the current was not effected so much by the rafts themselves as by the installation of aprons on the downstream edge, though so far this has only been done on raft No. 1. These aprons consisted of panels constructed of willows from 12 to 14 ft. long set up and down, well braced and interlaced with wire fencing, each panel being about 7 ft. wide with three cross pieces. The entire apron was weighted down by the addition of large stones held in position on the bottom brace by looping the fence wires around them, after which the completed aprons were then lowered over the downstream side of the raft, the upper part being fastened by wire braces running back some 10 ft. from the edge of the raft and of such a length that the raft could have considerable movement without disturbing the apron. After enough silt



One of the Willow Aprons

has been deposited to thoroughly embed the stones and thus hold the aprons in position, the wire braces will be cut, leaving the rafts free to rise with the waters. The shallow inshore sections were handled by working willows into the river bottom without the necessity of constructing panels, lacing them together at the top with wire and making them fast to the raft in a manner similar to that for the aprons.

In spite of the low water at the time of the installation (0.4 ft. below government low water datum), the action of the retards was at once noticeable. Soundings taken on the downstream side of raft No. 1 showed the water to be 4 ft. deep which, in comparison with its previous depth of 10 ft., indicated a fill or deposit of silt approximating 6 ft. in depth. A photograph taken later, after the water had fallen about 2 ft., showed the crest of a sand bar, indicating a further fill of about 3 ft. in addition to the 6 ft. already mentioned. The current was also deflected further to the west and was again split as in the old installation of retards. In this case the western branch of the current is cutting a new channel through the large sandbar which had been built up on the opposite shore, while through the deflecting action of rafts No. 2



Method of Constructing the Retarding Fence

and 3 the current is being forced across the long, narrow bar that originally split the stream before the rafts were installed, resulting in the gradual disappearance of this bar and the rapid cutting away of a larger bar which lies just west of it.

ACTION DURING HIGH WATER

While the installation to date has proved very successful in the handling of the Missouri river at this point during low water, it has yet to be tried out during high water. However, as it was designed pre-eminently to retard high waters and as its action up to now has been along the lines planned, considerable confidence is felt by the officers in charge that it will do all it was designed to do. The contemplated action during high water is similar to that which is now going on, i. e., the forming of bars both under the raft and on the downstream side, leaving the raft floating free, or practically free, at all times. Where a large amount of debris, etc., fouls the upstream edge only, the upper third of the section in question will be sunk, the depth depending somewhat on the amount accumulated, the tendency being to float the debris over the surface of the raft, due to its flexibility and the action of the current, with no one section being completely sunk for its full width. With the receding of the waters the raft may be left either entirely or partially supported by the bar formed, in which case there will be some cutting along the midstream edge that will continue until the raft is again completely afloat, when, with the resuming of the retarding action, it will necessarily cease.

The triangle between the railway and the river bank is chiefly low land, which overflows regularly at high water and through the fact that it has in the past worked its way east, cutting into the right-of-way and entering into the river near mile post 480, considerable damage has been done to the mattresses and revetments placed along the shore at or near this point. In order to eliminate this trouble which would, no doubt, undo much of the good brought about by the rafts, it was decided to construct a willow fence to retard the overflow current. By refer-

ence to the map it will be seen that the proposed fence, which is about 2,600 ft. long, runs from a point on the bank about 300 ft. upstream from raft No. 1 to the edge of a cornfield and on a direct line to Folsom.

TWO TYPES OF FENCE

The actual construction will be of two types following the retarding principle rather than the actual damming of the water, since it is desired to build up this low land. A path one foot wide will be cut through the heavy growth of willows, the cut pieces being thrown lengthwise in the path and piled up to the height required, the fence thus formed being carefully tied and laced together by wire and braced with tie cables fastened at intervals along the fence and running upstream to the base of growing willows. Open places will have built-up fences with supports made from two 8-ft. crossties, one length being laid in the ground on the lower side and at right angles to the prescribed line, the other being cut into two pieces to form the upright and its brace. Two 3/8-in. cables running lengthwise of the fence and securely fastened to the uprights, support the actual retards which are constructed from willows and wire fencing in a manner similar to the aprons installed on the downstream side of the raft. To prevent the built-up type of fence from washing out, it is anchored to deadmen set opposite each post and sunk to a depth of four feet.

The river bank protection work was planned by and constructed under the direction of C. L. Persons, assistant chief engineer, and G. A. Laubenfels, district engineer, the contract for the work being let to the Wood Brothers Construction Company of Lincoln, Neb.

A HAND HOLD FOR PNEUMATIC HAMMERS

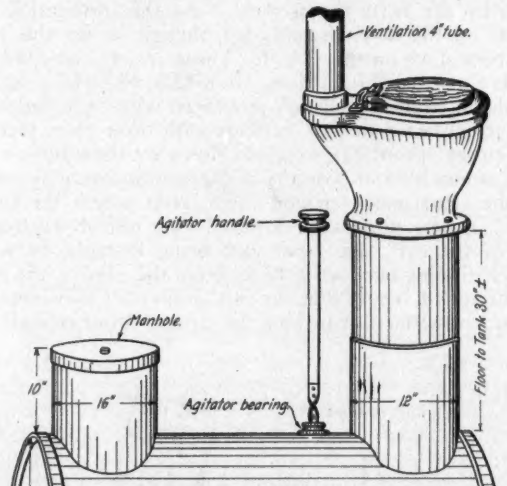
A DEVICE has recently been introduced to overcome two difficulties attending the holding of the lower end of a pneumatic hammer, namely, the danger of burning the hand and the disagreeable jar caused by the rapidly moving tool. It also serves as a reliable set retainer.

The Boyer Grip and Method of Using It

This is known as the Boyergrip and is manufactured by the Chicago Pneumatic Tool Company, Chicago. The device consists of a frame designed to fit over the end of the hammer with a hinged handle that enables the operator to secure a firm grip without having to take hold of the cylinder. Another advantage of the device is that it does not take up as much room around the cylinder as the operator's hand and therefore gives a less obstructed view of the work from all angles. The Boyergrip is made of steel and has only two parts in addition to the bolt that holds them together. A modified form has been placed on the market which is adapted for chipping and calking.

A SUBSTITUTE FOR WATER TOILETS

THE EXPERIENCE of draft boards and insurance companies points to the fact that the physical condition of men resident in rural communities is generally inferior to that of men who live in cities. One of the causes of this condition has been said to be the lack of sanitary conveniences in rural districts where sewer systems are unavailable at a reasonable cost. Necessarily the railroads must maintain forces in sparsely settled communities, in labor camps, in isolated passenger stations, shop buildings, signal and watchman's towers, etc. In such localities the roads are faced with the necessity of providing substitutes for modern sewage disposal sys-



Arrangement of Waterless Toilet

tems or of resorting to makeshift antiquated methods contrary to present tendencies towards better working conditions for employees. To meet the requirements in these remote localities, the Chemical Toilet Corporation of Syracuse, N. Y., has perfected a substitute for water toilets which may be made to accommodate any number of men. This is known as the Perfection toilet, in which a chemical is relied on for sterilization, and ventilation to carry away the odors.

In appearance this toilet is similar to the ordinary water toilet. The vitreous china bowl is attached to an acid-proofed drop tube 12 in. in diameter which leads to a Toncan iron tank in which has been placed the Perfection chemical which deodorizes and liquefies all solid matter, kills all bacteria and reduces the contents of the tank to a harmless state. The tank is fitted with a 16-in. manhole and an agitator. It may be drained by means of a pump introduced through the manhole and by drain valves located inside or outside the tank as desired. The toilets are simple in construction and easy to erect.

ACTIVITIES OF THE RAILROAD ADMINISTRATION

The Progress on Railway Legislation Is Slow

Recent Statistics Show Deficit Increasing

Washington, D. C.

UNCERTAINTY as to the exact form which the legislation fixing the conditions under which the roads will be returned to their owners will take continues to be the principal influence affecting railway activities. The conferees of the House and Senate have harmonized a number of the less important provisions of the Cummins and Esch bills, but little progress has yet been made on the more important provisions relative to rates and guarantees, the consolidation of roads, strikes, etc. The conferees have been suffering from no lack of expert advice. Voluminous memoranda or arguments for and against various sections of the bills, with reasons why this should be left out or that put in have been filed with them by organizations interested in the legislation, while other members of Congress are being besieged individually by the various "lobbies."

With the end of government control approaching rapidly, neither the Railroad Administration nor the corporate managements are in a position to undertake important measures for the rehabilitation of the properties or the improvement of service and both interests are marking time. The delay in the legislation is doing much to overcome the benefits of the president's announcement, in so far as the season's program of maintenance and improvement work is concerned, for with the present state of uncertainty, the corporate managements are not in a position to undertake extensive programs which will require the expenditure of large sums of money. If this uncertainty and delay continue much longer the effect will be to curtail greatly the improvement program for the year, for even if satisfactory legislation is passed late in February, it will then be impossible to secure all of the materials which will be necessary for a full season's work.

Following the president's announcement fixing the date of return of the roads there has been a marked tendency for those in the Railroad Administration to leave the government service for private employ. Among the recent resignations from the Railroad Administration is that of Hale Holden, regional director of the Central Western region, who has been elected president of the Chicago, Burlington & Quincy and the Colorado & Southern, positions which he held prior to federal control. His appointment is effective on the termination of his connection with the Railroad Administration and he has agreed to remain with the Railroad Administration temporarily and probably until the termination of federal control at the end of the month.

Policy as to Rail and Tie Purchases

The Division of Purchases of the Railroad Administration has been co-operating with the railroad companies in determining a policy as to the purchase of ties and rails for use after the termination of federal control, with a view of getting the necessary orders for future delivery placed without too great disturbance of the market by the resumption of competitive purchasing. H. B. Spencer, director of the Division of Purchases, after a conference with representatives of the regional directors, discussed the matter with representatives of the Association of Railways Executives, who finally referred it to the advisory committee headed by W. W. Atterbury, vice-president of the Pennsylvania, and this committee has had further conferences with the Division of Purchases.

As to ties, decision was reached that the Division of Purchases will continue its present practices until March 1 and the railroad companies are looking after their own requirements beyond that date. As to rails, the Railroad Administration engaged to take at $47 a ton all open hearth rail delivered during January and February with the understanding that the companies will take those not actually used during that time and the companies are placing their own orders for future delivery.

In accordance with this plan, the Railroad Administration has made contracts with the Illinois Steel Company, the Lackawanna Steel Company and the Colorado Fuel & Iron Company for all the open hearth rail they can turn out before March 1 at a price of $47. The Illinois Steel Company estimates that it can deliver 25,000 tons, the Lackawanna Company 15,000 tons and the Colorado Fuel & Iron Company 2,500 tons. The Midvale Steel & Ordnance Company offered to roll 30,000 to 40,000 tons at a price of $57, but the offer was not accepted, and the Bethlehem company was not in a position to take additional orders. The Railroad Administration, in the spring of 1919, ordered 200,000 tons of rails and in the fall ordered 41,000 tons additional.

November Increases Government Deficit

Net operating income of the railroads in November, 1919, reached the lowest point it has reached in November for 30 years, amounting to only $22,000,000, as compared with $57,000,000 for this month in 1918, $76,000,000 in 1917 and an average of $83,600,000 for November during the three-year test period. This makes the government deficit for the month $61,000,000, as compared with the standard return of the test period, or $53,000,000 as compared with one-twelfth of the annual rental guaranteed by the government, and brings the deficit from railroad operations for the year up to over $290,000,000, after charging back to 1918 some of the back pay which was paid in the early months of 1919. Adding this to the $236,500,000 loss in 1918, makes a total of $527,200,000 for the 23 months of government operation, without counting the expenses of the Railroad Administration and the deficits from other than railroad operations, such as Pullman car lines, express, waterways, etc., for 1919, which has not yet been reported. This will be reduced, however, by a decision of the Interstate Commerce Commission increasing the rates for mail transportation retroactive to November 1, 1916.

When the December returns are in it is estimated that the total loss of the government will be about $700,000,000, aside from whatever may be the results from the adjustment of the materials and supplies accounts, capital expenditures for war purposes and the maintenance accounts, etc.

The net ton miles of revenue and non-revenue freight handled in November aggregated 32,539,000,000, a decrease of 8½ per cent as compared with November, 1918, while passenger traffic increased.

Director General Hines on January 3 authorized a statement discussing the November returns from which those who desire to do so may derive an argument that the Railroad Administration was financially successful during the four months preceding the coal strike, July to October, inclusive, because it shows a profit for those months of $45,200,000 as compared with four-twelfths of the annual rental, although in a parallel column it is shown that the net operating income in those months was actually $3,300,000 less than the proportion of the annual rental earned during the corresponding months of the three-year test period, ended June 30, 1917, which were the months of July to October, 1914, 1915 and 1916.

The statement also shows that if the increased rates had been in effect throughout the period of federal control there would have been a surplus for 22 months of $14,000,000. It might also be pointed out that, if this had been the case, while the result for 1918 would have shown a profit of $257,500,000 instead of a deficit of $236,500,000, the result for 11 months of 1919 would still have been a deficit of some $290,000,000.

MATERIAL INVENTORY TO BE TAKEN AS OF FEBRUARY 29

Director General Hines has issued General Order No. 62-A, directing that the material inventory required by General Order 62 shall be taken as of February 29, 1920, instead of during the months of October, November or December, 1919. Roads which have already taken an inventory in October, November or December, 1919, under General Order 62, will be permitted to adjust such inventory by the addition of receipts and deductions of issues of material to February 29, 1920, when in the judgment of the federal manager accurate results may thus be obtained.

REGIONAL DIRECTORS REPORT

The regional directors have submitted annual reports to the Director General of Railroads on the results for the calendar year 1919. The reports of A. T. Hardin, regional director of the Eastern region, and Hale Holden, regional director of the Central Western region, contain references to maintenance work during the year and the present condition of maintenance, which are abstracted below.

Mr. Holden states that the railroads generally in the Central Western region have been well maintained and in some instances the shortage of a normal program in 1918 was overcome in 1919. Special effort was made to confine the work of maintenance of way to prescribe hours of service and to avoid the expenditures of overtime, resulting in a marked reduction of overtime and its ratio to total expenditures. To the end of October, 1919, 77 per cent of the total tie requirements had been inserted, compared with 79 per cent for the same period in 1918.

However, by comparing the actual number of ties inserted in 1918 with that of 1919, there is an increase of 4.4 per cent for the 10-month period of 1919 over the same period in 1918. To the end of October 62 per cent of the total estimated rail program had been laid and 23 per cent of it was available for placing in track.

The report of Mr. Hardin outlines the difficulties confronting the roads in the work of maintenance and repairs, and said:

"Speaking in general and with the exception of the shortage in the amount of major materials used, the roads in the region as a whole have been reasonably well maintained. In some instances a material shortage of labor has made it very difficult to carry out the maintenance program as made out. Where roads had apparently overexpended in 1918, every possible effort has been made to reduce the expenditures during the latter part of the year to the actual necessity from the standpoint of safety in operation. On the other hand, where roads underexpended in 1918 and a material increase in the maintenance budget was necessary this year in order to get the road back in as good condition at the end of the year as of January 1, 1918, no reductions have been made and every effort possible has been made to carry out the necessary work. In most cases results have been reasonably satisfactory except where the shortage in tie supply, rail requirements or other conditions over which we have no control have made it impossible to apply the necessary materials."

AUTOMATIC TRAIN CONTROL COMMITTEE REPORTS

The Automatic Train Control Committee, which was appointed by the Director General of Railroads a year ago, recently made a report to W. T. Tyler, director of the Division of Operation. The committee recommends that its work be continued and makes several suggestions as to the manner of organizing so as to carry on its work under the jurisdiction of the American Railroad Association. The conclusions of the committee are listed below, with the exception of Conclusion 5, which names 16 different devices which merit further investigation:

1. That the relative merits of the various types of automatic train control cannot be determined until further tests have been made.
2. That more extended service tests (including complete records of performance) are necessary before a decision can be reached on the availability, for general practical use, of any of the devices that have been brought to the attention of the committee.
3. That on a large part of the railroad mileage in the United States, with a given amount of money available for protection purposes, a greater degree of safety can be obtained by installing block signals than by installing automatic train control devices.
4. That on lines of heavy traffic, fully equipped with automatic block signals, the use of train control devices is desirable.
6. That it does not appear necessary to make tests of all of the devices of a type to determine the availability of that type for general practical use.
7. That a committee on automatic train control should be continued.

IMPROVEMENTS DESIGNED TO REDUCE OVERTIME

In Circular No. 95, issued by the Northwestern region, United States Railroad Administration, R. H. Aishton, regional director, calls attention to the fact that the time and one-half rate for overtime given to train and enginemen in all classes of freight service results in a considerable increase in the cost of transportation unless steps are taken to avoid this overtime. In listing a number of suggestions whereby arrangements may be made for reducing overtime he includes a number of ideas for possible additions or improvements to facilities which accomplish this result. These are listed below and warrant careful consideration:

(a) Adequate engine house facilities, including in and outbound tracks, cinder pits, coal and water stations.
(b) Running tracks between engine houses and yards.
(c) Installation of air-testing plants in all yards of any importance to insure that when an engine is coupled to the train, the air brakes will be in working order, and the regulation air brake test can be made without delay, thus eliminating delays which now occur by necessity of setting out cars on account of defective air-brake apparatus.

(d) Extension of yard tracks to hold an entire train, and the extension of yard facilities to permit the accumulation of cars for solid through trains.

(e) Extension of passing tracks to proper length to hold one or more trains, the lack of which now makes necessary the backing over in double-track territory to clear superior trains, and with the consequent interruption of traffic on the opposite main line.

(f) Extension of second tracks in and out of terminals to permit prompt clearing of main lines.

A NEW TRACK SPIKE

A TRACK SPIKE which, it is claimed, does not crush or break down the fibers of the wood in driving, thus reducing spike killing, which has been the main point of weakness in the preservation of ties in track, has recently been placed on the market by the American Spike Company, New York. This spike, known as the Sessler Grip spike, is made of soft steel with dimensions and specifications complying with those of the screw spike prescribed by the American Railway Engineering Association.

The Spike Cuts the Wood Fibers

While embodying radical changes in design, this spike requires no change from the ordinary spike in the method of application. It has a fluted, twisted shank which provides a greater area in contact with the tie, thus increaing the holding power, and a round head, not unlike a screw spike with the nut portion removed. The spike has four cutting edges, thus ensuring straight and easy driving, and the grooves in the shank are formed so that the spike turns on its axis slightly when being driven and withdrawn. No special tools are required with its use, an ordinary spike maul serving to drive it in the tie and an ordinary claw-bar to extract it.

Because of its round head this spike may be reused after throat cutting sets in or a portion of the head is destroyed by a derailment or other cause, as it can be re-driven so as to have another point of contact with the rail base. As may be seen in the photograph, there is a close contact of undisturbed wood fibers and the shank of the spike when it is driven to place. This results in resistance to the introduction of moisture, which not only preserves the wood about the shank, but also reduces the destructive effects of such moisture freezing in the ties, thus forcing the spike upward and setting up a splitting action.

The Spike Has a Fluted, Twisted Shank

Laboratory tests made of these spikes, an account of which was published in the December, 1919, issue, disclose the fact that it is strongest where the strength is most needed, i. e., in the beginning of the pull, that it can be subjected to high stress an indefinite number of times without any appreciable set in the tie and that its elastic withdrawal resistance is high as compared with other types of spikes now in common use.

It should also be noted that during the manufacturing of the spike a compression of the steel is accomplished which makes it similar to a drop forging. This results in a strong resistance to corrosion.

BROTHERHOODS PLAN DRIVE ON COST OF LIVING

A PLAN for reducing the cost of living through their own efforts is under consideration by the railway brotherhoods and other labor organizations. This plan, which includes co-operative buying, production and distribution, has led to the formation of the All-American Farmer-Labor Co-operative Commission, as announced in Washington on January 7. The officers to carry out the plan will be the officers of the railway unions. Another conference is to be held in Chicago on February 12, when the plans are to be perfected.

The first tangible action along this line has been taken by the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, which has recently purchased four clothing factories from which goods will be sold, at price reductions ranging, it is estimated, from 25 to 60 per cent. The factories already purchased by the brotherhood include knitting and underwear plants at Ypsilanti, Mich., a glove factory at Williamston, Mich., and a tubing factory at Watertown, N. Y., manufacturing tubing used in gloves.

Unverified reports of such action had been in circulation since the authorization of such a plan at the national convention of the brotherhood in Detroit, Mich., in September, 1919, but the present report has been verified by officers of the brotherhood, who announce that the various purchases consummated represent an initial investment of approximately $1,000,000 and are but the first steps in a campaign to reduce the cost of living for members of the brotherhood. The sale of the products of these plants will not be confined to the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, but arrangements are being made to sell the products of these brotherhood-owned plants to the members of all railway brotherhoods. O. C. Trask, assistant grand president of the organization, has also announced that negotiations probably will be concluded within two weeks for the purchase of two other mills in Toledo, Ohio.

Some idea as to the manner in which the goods manufactured under this management are to be distributed is indicated by a circular letter and price list of gloves and mittens recently issued by the brotherhood. The letter does not emphasize the low prices of the goods offered particularly, but calls attention to the quality of the goods and the fact that they are union made, since one of the first steps of the brotherhood upon purchasing the various properties has been to unionize the employment in them. No specific information has been issued in regard to the extent to which the employees of these factories will participate in the management. Some idea of the object of this undertaking and the ends which it is expected to obtain is to be gathered from the following quotation from the circular:

"The principle back of this movement is industrial democracy—or at least one phase of it—and this particular plan has been adopted because it is the quickest way to get results. Just enough has been added to the cost of each article to pay overhead, and it is very much to your interest to actively participate in this plan, as you have an opportunity which has never been offered to organized labor before of saving far more (by the judicious expenditure of your money) than you pay out in dues."

How Railroads Are Maintained in China*

The Organization of Forces and the Standards of Construction Contain Many Points of Interest to Americans

By Frank Rhea

ALL THE PRESENT railways have been built almost entirely by hand labor, chiefly on account of the large supply of cheap and industrious labor in all parts of China. This applies even to the breaking of rock ballast, which has been done by hand. Bridge masonry, buildings, station platforms, and much similar work has been contracted for with Chinese subcontractors, and in some instances this procedure has been followed in the case of earth and rock grading work (called in China "formation"). With the supply of good cement, stone, and cheap labor, and in view of the scarcity and high price of lumber, there is a growing tendency to use concrete in every way possible, particularly as most Chinese laborers seem to make as good concrete workers as stonemasons.

The maintenance methods and tools are much the same on the several railways. The following data furnished by A. C. Clear, engineer in chief and general manager of the Shanghai-Nanking and the Shanghai-Hangchow-Ningpo railways, and Ivon Tuxford, maintenance engineer of the same line, are fairly typical of all the lines, but the methods are probably worked out in more complete detail than is the case on some of the other lines. On this system the engineer in chief is in general charge of roadways, bridges, buildings, etc., the work being under the direct charge of a maintenance engineer, with district engineers in charge of districts. The district engineers have assistant engineers, usually in charge of about 100 miles of line, and, for the direct administration of the work, these assistant engineers have inspectors, who do not have more than 70 miles of line. The inspectors' territory is divided into sections of about 15 miles, and these again are divided into sub-sections, usually of 5 miles. There is a section foreman for each of the 15-mile sections, a gang for each 5-mile sub-section, and a flying (extra) gang for each 20 miles of line.

The regular gangs for the 5-mile sub-sections consist of 1 ganger (foreman), 2 leading coolies, 10 coolies, and 1 cook, and the flying gangs consist of 1 ganger, 10 coolies, and 1 cook. Permanent ganghouses, consisting of three rooms and a kitchen, are provided for the regular gangs. The flying gangs, being constantly on the move, receive $3 Mex. per month for house rent.

The following are the rates of pay for the above gangs; they are approximately the same as are paid in other parts of China for men of equal qualifications: section foreman, $25 Mex. to $35 Mex. per month; sub-section gangs—ganger (foreman), $15 Mex. to $20 Mex. per month; leading coolies, $10.50 Mex.; coolies, $8 Mex.; cooks, $5 Mex.; level-crossing keepers (crossing watchmen), $6.50 Mex.; "flying" gangs—ganger, $21 Mex. per month; coolies, $9 Mex.; cook, $5 Mex.

It will be noticed from the above that some of the wages are scaled. The section foremen, being seasoned, tried men, are paid according to experience. The development of this force and the scale of pay is explained in the following excerpt from a paper by Ivon Tuxford, published in papers of the Engineering Society of China:

> Gangers are mentioned from time to time in the monthly report by the divisional permanent way inspector, and if no complaint has been recorded for six months they receive an increase in pay of $1 per month, and as long as the section is maintained in good order and the gangs in a state of efficiency, without any complaints being recorded, an increase of $1 per month every six months is given until the maximum pay for a ganger, $20 per month, is obtained. Gangers receiving $20 per month are eligible for promotion to section foremen. Leading coolies are eligible for promotion to gangers provided no complaints have been recorded against them after a period of at least 12 months' service.
>
> For not turning out the gang in time, leaving work too soon, not carrying out instructions promptly, allowing coolies to neglect their work, not keeping the section neat and tidy, or similar misdemeanors, gangers are punished in the first case by a reduction in pay of $1 per month; second case, $2 per month; third case, dismissal. If, however, a ganger receives good reports for six months after the first complaint he receives his former pay, and such complaint does not stop his further advancement. After two complaints the ganger must receive good reports for six months before getting an increase of $1. At the termination of 12 months' good conduct he reverts to his original pay, and the complaints do not stop his further advancement. The dismissal takes effect if two complaints are still recorded against the ganger when the third is made.
>
> Every permanent-way gang coolie is medically examined, particularly as to sight and hearing, this being necessary for obvious reasons.

Bridges and Buildings

One serious handicap from which the Chinese railways are now suffering and which it will be very expensive to remedy is the fact that all the bridges that have been built to carry what American railway men consider very light loads. In only a few cases does the load exceed the equivalent of Cooper E-40, and in a number of instances it is as low as Cooper E-35. A good example is the Shantung railway, where the Japanese management is desirous of using heavier motive power, but is unable to do so because the bridges only carry a load equivalent to Cooper E-35; there are about 1,000 structures involved, but most of them are short single spans. Each nation has followed its peculiar practice. The Germans, French, and Belgians use a style of floor system with a stringer carrying the rail, with no bridge ties and the space inside and outside the rails filled with metal plates. This makes failure of the structure almost certain in case of derailment. This type of construction has been used on the Peking-Hankow, Cheng-Tai, Pienlo, and Shantung lines and the German section of the Tientsin-Pukow. The British have followed their standard practice (which applies also to all materials fabricated at the Shanhaikwan bridge works of the Peking-Mukden railway), but their floor system is very similar to the American practice and does not have the above disadvantage in case of derailment.

It is also apparent that on some of the lines sufficiently large openings have not been provided. This has been forcibly demonstrated during the last year, particularly on the Peking-Hankow and the German section of the Tientsin-Pukow. On the first line the bridge construction has been much criticized. While the bridges are unquestionably very light, it is doubtful whether any set of engineers would have provided sufficient openings to take care of the excessive floods of the past year in this

*From a report on the market for railway supplies in the Far East, issued by the Department of Commerce. Mr. Rhea spent the larger part of two years in China and other countries of the Orient as a special agent for the Department of Commerce, investigating the opportunities for the introduction of American railway materials there.

part of China. The fact is that some of the lines will be compelled to do considerable reconstruction of their bridges in the future.

On account of the great scarcity and high price of lumber, there is a decided tendency to construct railway buildings of all classes with brick, stone, or concrete. On most of the lines very substantial buildings of all classes have been provided, and, as already mentioned, in some instances these are elaborate and ornate.

CROSSTIES

The supply of crossties (sleepers) is a matter of the greatest importance to all the Chinese railways. No part of China, except portions of Manchuria, has any timber suitable for ties. In the past most of the ties used have come from the North Island of Japan, and this will probably remain the main source of supply for some years to come. These ties are termed Japanese oak, but about 70 per cent are oak and the other 30 per cent a mixture of Japanese katsura and tamo. In addition, apitong, Australian jarrah, mixed hardwoods, Hailin pine or Manchurian red pine, and Oregon pine have been used in varying quantities. The usual dimensions have been 6 by 9 in. by 8 ft., except in the case of the jarrah, which was 5½ by 9 in. by 8 ft. The apitong and jarrah, both being very dense, have to have holes bored for the track spikes.

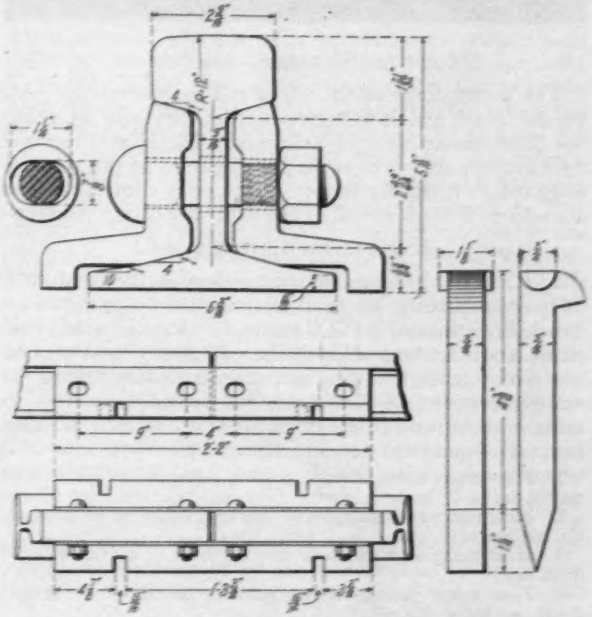
The Germans used a very substantial pressed-steel tie in the construction of the Shantung railway; it has given satisfactory results, but must have had a very high first cost, though it was impossible to obtain any data on that point. On account of the entire lack of any kind of timber for a supply of crossties, and in view of the large supply of iron ore and fuel, it would seem that the final solution of the crosstie problem in China is likely to be the use of a steel tie. One of the many desirable features of such ties would be the possibility of laying them on the subgrade and using them, at least temporarily, without ballast.

RAIL

The Han-Yeh-Ping steel works at Hankow are supposed to furnish all the rail and joint material required for the construction and renewals of the Chinese Government railways, but because of the limited output (not exceeding 30,000 tons of rail a year), the rapidly growing demand for all kinds of iron and steel products has been so much beyond the capacity of this plant that a considerable amount of rail has been imported, and until there is an increased production this will probably continue to be the case in the future. On an accompanying drawing is shown the detailed section of an 85-lb. rail, which can be considered the Chinese standard section and has been used on the Peking-Suiyuan, the British section of the Tientsin-Pukow, the northern section of the Canton-Hankow, the Shanghai-Hangchow-Ningpo, and the Pienlo. As illustrating the restrictions resulting from some of the loan agreements, it may be mentioned that, although the rail for the German section of the Tientsin-Pukow line was furnished from the Han-Yeh-Ping works, it was insisted that this be a German section weighing 67.3 lb. per yard. The Belgians used a 76-lb. Belgian section on the Peking-Hankow railway, and in several other instances special sections were required, with the well-known disadvantages and expense to the steel company involved in providing special rolls.

RAIL FASTENINGS

The details of angle bars, joint bolts, and track spikes in general use are also shown on the drawing. This applies particularly to the lines on which the Chinese standard section of 85-lb. rail is used. It will be noticed that the spike is the typical dog-eared British track spike, usually spoken of as a "dog spike." Except for the jarrah and apitong ties, it is not the rule to bore the spike holes or seat the rail. Screw spikes have been used on a very considerable portion of the Peking-Hankow line. Their application is very similar to the general American practice where tie plates are used. On the German section of the Tientsin-Pukow, German tie plates and screw spikes have been used that are different from those em-



Chinese Standard 85-Lb. Rail

ployed on any other line in China, and, again, on the pressed steel ties on the Shantung railway a different fastening of German design was used.

FROGS AND SWITCHES

In the Chinese Government railways system of uniform accounts, points and crossings (frogs and switches), signals and interlocking gear, and electric staff apparatus all come under one construction account, which is divided into three sub-accounts. One design of switch stand is in very general use on all the lines. All the other materials coming under this account conform, in general, to the practice of the country furnishing the loan funds for the construction of the line. A typical construction of switch used on all the German, Belgian, and French lines is made from a heavy rolled form, which is planed down, making a very robust switch point; the installation is substantial with a heavy iron plate extending the entire length of the point. The frogs used are of the same general design. The British design of points and crossings is very similar to the American switch-and-frog practice. There is a growing tendency for all the lines to manufacture their own switches, frogs, and switch stands in their own workshops, and, in doing so, to follow the general lines of the British practice. There is a very great variety of derailers, but in nearly all instances they might be called "home-made" devices.

Thus far very few anticreepers or rail anchors have been used on any of the Chinese Government railways, but it is apparent at many places that their use would be very beneficial, although rock ballast in fairly liberal quantities has been used on many of the lines. The Shanghai-Nanking railway has used some rail anchors with satisfactory results.

BRIDGE AND BUILDING ASSOCIATION

The proceedings of the Cleveland convention are now on the press and it is expected that they will be ready for distribution early in February. The committees are now actively at work on the investigation of the subjects assigned to them for report at the next convention and a number of them already have made important progress.

ROADMASTERS' ASSOCIATION

L. C. Ayers, assistant superintendent on the Norfolk & Western at Crewe, Va., and chairman of a committee on Track Equations of the Roadmasters' Association has prepared and sent to a selected list of railway men a questionnaire intended to bring out information concerning the relative amount of work required to maintain various units of a railway in comparison with one mile of main line. The questions are as follows:

1. How many miles average passing siding equal one mile of main line?
2. How many average miles of storage, industrial or commercial sidings equal one mile of main line?
3. How many average main line turnouts equal one mile of main line?
4. How many average siding, yard or other inside turnouts equal one main line mile?
5. How many average main line railroad crossings equal one mile of main line?
6. How many average siding railroad crossings equal one mile of main line?
7. How many heavy traffic, important city street crossings equal one mile of main line?
8. How many (medium) important city street crossings equal one mile of main line?
9. How many light traffic street crossings or outlying highway crossings equal one mile of main line?
10. How many average farm crossings or other unimportant crossings equal one mile of main line?
11. How many average stock chutes and pens equal one mile of main line?
12. How many average re-icing stations equal one mile of main line?
13. How many average watering stations equal one mile of main line?
14. How many average interlocking plants equal one mile of main line?
15. How many average cattle guards equal one mile of main line?
16. How many average feet of track in tunnels equal one mile of main line outside?
17. How many average coaling stations equal one mile of main line?
18. How many average fire or cinder cleaning stations equal one mile of main line?
19. How many average stations grounds equal one mile of main line?
20. How many average automatic signals and incidental fixtures equal one mile of main line?
21. How many miles of average fencing equal one mile of main line?
22. How many feet of ordinary, average ditching will equal one mile of main line?

In answering the foregoing questions, please bear in mind that the general average conditions should be considered in all cases. Also consider that the extraordinary items covered by these questions bear the same relative importance as the main line of which they may be a part.

To establish a basis upon which the extraordinary items should be considered in increasing or decreasing the length of a section, it seems proper to undertake first to establish what the length of an average outlying section should be, having none of the extraordinary items contemplated. Therefore, please answer the following questions:

1. Assuming a double track railroad having an average normal gross tonnage of 100,000 per day or 40 freight trains, 20 in each direction, with an average normal number of twelve passenger trains, using a maximum speed of sixty miles per hour; grade generally level, 3 per cent maximum; line 30 per cent curvature, 6 deg. maximum. What length sections should be established at outlying points if no such conditions prevail as are listed in the above questions?
2. What length sections should be established on a single track railroad, having the same curvature and gradient, with one-half the gross tonnage and one-half the number of passenger trains as listed above?
3. How much should such sections be lengthened or shortened for each 25,000 gross tons and two passenger trains daily that might be added or taken off on such double track sections?
4. How much for a single track section for each 12,000 gross tons or one passenger train?
5. What difference should be made in the mileage of a double track section having motor cars as compared with hand cars?
6. What on single track sections?

A. R. E. A. NOMINATES OFFICERS

The Nominating Committee of the American Railway Engineering Association has nominated the following members for officers for the ensuing year:

President—H. R. Safford, engineering assistant to Regional Director, Central Western region, United States Railroad Administration.

Vice-President—L. A. Downs, assistant general manager, Illinois Central.

Secretary—E. H. Fritch.

Treasurer—G. H. Bremner, district engineer, Bureau of Valuation, Interstate Commerce Commission.

Directors (three to be elected)—E. E. Adams, consulting engineer, Union Pacific System; J. M. R. Fairbairn, chief engineer, Canadian Pacific; F. G. Jonah, chief engineer, St. Louis-San Francisco; Edwin B. Katte, chief engineer, Electric Traction, New York Central; F. P. Patenall, signal engineer, Baltimore & Ohio System; Thos. S. Stevens, signal engineer, Aitchison, Topeka & Santa Fe System; E. B. Temple, engineering assistant to Regional Director, Allegheny region, United States Railroad Administration; F. E. Turneaure, dean, College of Engineering, University of Wisconsin; J. E. Willoughby, chief engineer, Atlantic Coast Line.

Nominating Committee (five to be elected)—W. A. Christian, senior civil engineer, Bureau of Valuation, Interstate Commerce Commission; Maurice Coburn, supervising engineer, Pennsylvania Lines; H. T. Douglas, Jr., chief engineer, Chicago & Alton; E. A. Hadley, engineering assistant to regional director, Southwestern region, United States Railroad Administration; C. M. McVay, division engineer, Kanawha & Michigan; Arthur Montzheimer, chief engineer, Elgin, Joliet & Eastern; U. E. Gillen, general manager, Toronto Terminals; A. W. Newton, chief engineer, Chicago, Burlington & Quincy Company; R. S. Parsons, chief engineer, Erie; W. P. Wiltsee, assistant engineer, Norfolk & Western.

The first two bulletins of the American Railway Engineering Association containing the reports of committees to be presented at the next convention have already been sent to the members. These contain the reports of committees on Water Service, Masonry, Buildings, Uniform General Contracts, Track, Electricity, Conservation of National Resources and Economics of Railway Location. Reports of all but three of the committees have been received by the secretary. Most of the committees completed their work some time ago, but the committees on Economics of Railway Labor and Yards and Terminals held meetings on January 13, and the committees on Signals and Interlocking and Economics of Railway Operation on January 15. Some idea of the size of the reports may be gained from the fact that the report of the committee on Track contains 60 plans.

AMERICAN SOCIETY OF CIVIL ENGINEERS

The sixty-seventh annual meeting of the American Society of Civil Engineers was held at New York on January 21 and 22. Business sessions were held in the forenoon and afternoon of January 21, followed at 9 p. m. by the president's reception. The afternoon session was devoted to consideration of the report of the Committee of Development. On the following day there was an excursion to the Port of Embarkation of the United States

Army at Hoboken and to the Brooklyn Navy Yard, while at 8:30 in the evening an informal smoker was held. All of the meetings took place in the rooms of the society in the Engineering Society's building, 33 West Thirty-ninth St.

AMERICAN WOOD PRESERVERS' ASSOCIATION

Owing to inability to secure adequate hotel accommodations from January 27 to 29, inclusive, the American Wood Preservers' Association was forced to postpone its convention until February 10-12. The program for this meeting has now been prepared and is as follows:

TUESDAY MORNING

Opening business.

TUESDAY AFTERNOON

Report of Committee No. 6—Preservatives. E. B. Fulks, chairman
What Light Creosote Oils Have Done in Wood Preservation ..... Ernest Bateman
Report of Committee No. 10—Non-Pressure Treatment.... ..... L. L. Hill, chairman
Perforation of Douglas Fir ..... E. M. Blake
The Penetration of Creosote in Various Sizes of Sawed Lumber and Round Piling..... Ralph H. Rawson
Determination of Water in Creosote Oil Storage Tanks.... ..... W. E. Jackson

WEDNESDAY MORNING

Report of Committee No. 4-A—Service Records..... ..... George E. Rex, chairman
(a) Tie Service Records..... Lowry Smith, sub-chairman
(b) D. L. & W. Service Test Records of Ties..... ..... C. E. Gosline, sub-chairman
(c) Southern Pacific Oakland Long Wharf..... ..... F. D. Mattos, sub-chairman
The Separation of Cross Ties ..... H. Von Leer
Report of Committee No. 5—Plant Operation..... ..... W. H. Grady, chairman
Iodine-Starch-Potassium Ferricyanide Color Reaction Test, to Determine Penetration of Zinc Chloride in Cross Ties ..... Galen Wood

WEDNESDAY AFTERNOON

Rapid Deterioration of Sap Pine Ties Due to Unusual Weather Conditions ..... C. O. Deabler
Fungi That Attack Cross Ties..... C. J. Humphrey
A Theory on the Mechanism of the Protection of Wood by Preservatives ..... Ernest Bateman
Results of Preliminary Steaming in the Treatment of Air-Seasoned Ties ..... S. S. Watkins

THURSDAY MORNING

Report of Committee No. 9—Terminology.. H. B. Hoyt, chairman
Report of Committee No. 7—Purchase and Preservation of Treatable Timber..... H. S. Sackett, chairman
Report of Committee No. 8—Wood Block Flooring and Paving ..... F. W. Cherrington, chairman
Report of Committee No. 4-B—Service Records, Flooring and Paving..... Walter Buehler, chairman

THURSDAY AFTERNOON

Election of officers, selection of meeting place and closing business.

ENGINEERING COUNCIL STUDIES LICENSING

Engineering Council in October, 1918, authorized the creation of a special committee of its members to investigate the subject of licensing or registering engineers, architects and surveyors. After 14 months' work the committee submitted its report, accompanied by a recommended uniform registration law, at the December, 1919, meeting of Engineering Council, who voted to receive the report and to give it and the proposed law immediate and wide publicity. The report shows that 10 states have already enacted laws registering engineers and at least 18 states have laws registering architects, which laws are not uniform in character and have often proved a serious detriment. The recommended law creates a state board of registration consisting of seven members appointed by the governor, of which at least three shall be professional engineers and three architects with a term of office of four years. In the main, all engineers, architects and surveyors over 25 years of age who submit satisfactory evidence to the board that they are qualified to practice engineering, etc., will be eligible for registration when the application is accompanied by the proper fee.

THE MATERIAL MARKET

THE RETURN of the railroads to private control on March 1 is being anticipated by inquiries from the corporate managements for a total of about 1,000,000 tons of rails, many of which have been consummated in actual orders. The railroads named in connection with these include the New York Central, 150,000 tons; the Santa Fe, 70,000 tons; the Burlington, 55,000 tons; the Rock Island and Union Pacific, each 40,000 tons; the Great Northern, 45,000 tons; the Erie, 28,000 tons; the Illinois Central, 20,000 tons; and 12 smaller lines with a total of 86,000 tons. As far as can be learned, the price of $47 per ton for open hearth rail still prevails. This activity in rails is reflected in increased interest in the market for track fastenings and other rail accessories. Thus the Rock Island is reported as inquiring for 15,000 tons of tie plates and the Burlington for 5,000 tons. The New York Central, Baltimore & Ohio, Seaboard Air Line and the Norfolk & Western have registered their needs for track spikes in large quantities.

The railroads are coming into a market of actively rising prices. The standard prices for basic articles of iron and steel established by the industry early last year are now virtually a dead issue. There have been advances nearly all along the line and, whereas several months ago there was a tendency toward some cutting below the standard prices, the present movement is all toward advances, as is indicated by the table below:

	Price in Cents Per Pound			
	January 15		December 15	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.35 to 3.50	3.62	3.35	3.62
Track bolts	4.35	4.62	4.35	4.62
Boat spikes	3.85 to 4.00	4.12 to 4.27	....	....
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.75	2.75	....	2.75
Tie plates, iron	3.25	3.25	....	2.90
Plain wire	3.50	....	....	....
Wire nails	3.25 to 4.50	3.52 to 3.77	3.25 to 4.50	....
Barbed wire, galv.	4.10 to 4.45	4.37 to 4.72	4.10 to 4.40	....
C. I. pipe, 6-in. or larger (per ton)	....	$66.80	....	$59.80
Plates	2.65 to 3.00	2.92 to 3.17	2.65	2.92
Shapes	2.65 to 2.75	2.62 to 3.52	2.45	2.72
Bars (steel)	2.35 to 3.00	3.02	2.75	2.87
Rivets	4.10	4.37	....	....

An even more pronounced tendency toward advances is shown in the market for scrap materials. There has been no particular change in the prices for relaying or rerolling rails, but the prices on rails less than three feet long and frogs, switch and guard rail scrap, cut apart, moved up $3 to $4 per ton during the month.

	Chicago	St. Louis
	Per Gross Ton	
Relaying rails	$40.00 to $50.00	$38.00 to $45.00
Rerolling rails	34.00 to 35.00	32.50 to 33.00
Rails less than 3 ft. long	28.50 to 29.00	26.50 to 27.00
Frogs and switches, cut apart	24.00 to 25.00	26.00 to 26.50
	Per Net Ton	
No. 1 railroad wrought	$25.50 to $26.50	$24.50 to $25.00
Steel angle bars	24.00 to 24.50	23.00 to 23.50

The same trend of the market is shown in the lumber field. In the southern pine region there has been an improvement in production and shipments, the shipments having exceeded the orders in production for the first time in several months. The condition in the Douglas fir territory is not as encouraging; the car supply is still inadequate, as indicated by back orders for 12,000 carloads of lumber for the railways alone.

GENERAL NEWS DEPARTMENT

Washington, January 29.

Claiming that the steel manufacturers have not been sufficiently interested in turning out rails for the Railroad Administration, the War Department has issued orders commandeering 72,500 tons of rails, to be delivered before March 1, under the authority of the National Defense Act which authorizes such commandeering for purposes connected with the military needs of the government. This step is being taken on the theory that the country is still technically at war and that the railroads are being used for military purposes. Thirty-six thousand tons are requisitioned from the Carnegie, Illinois and Tennessee plants of the United States Steel Corporation, 16,500 tons from the Bethlehem Steel Company and 20,000 tons from the Midvale Steel Company. The Railroad Administration has attempted to place orders for rail, but has been able to get the steel companies to accept only 42,500 tons. It is reported that the steel companies resent the use of the technicality, but that they will comply with the order.

The Durand (Mich.) Co-Operative Association, composed mainly of railway employees, has recently been organized for the purpose of operating a community store where necessities will be sold at cost plus operating expenses. The organization will be capitalized at $10,000.

The Interstate Commerce Commission has requested an additional appropriation of $500,000 for carrying on the work of the Bureau of Valuation. Charles A. Prouty, director of the bureau, in testifying before the Appropriations committee of the House of Representatives, predicted that the federal valuation of the railroads would be completed within two years.

The Railway Business Association, which for the last two years has held its annual meeting at Chicago, will resume this year its former practice of convening in New York. The meeting will be held at the Waldorf-Astoria hotel on March 31, with a business session at 11 a. m., luncheon at 12:30 p. m., reports of convention committees and election of officers 1:30 p. m., and dinner at 7 p. m. The speaking program will be announced later.

The American Association of Engineers, Chicago, has made arrangements with the producers of six screen weeklies whereby the association will furnish lists of engineering works, views of which will be of interest to the public. The moving picture companies will then arrange for photographs to be taken for display in their films. The association requests the co-operation of engineers in calling to its attention projects which would be of interest in this way.

Railway unions in many of the leading towns in Great Britain on January 5 adopted resolutions rejecting the government's offer of increases in wages amounting to approximately 100 per cent over pre-war wage rates. Their chief objection is that the government took as a basis the average pre-war pay of over 15 of the largest railway companies and not the highest graded pay, adding thereto the war bonus of 38 shillings, thus fixing a proposed minimum wage.

The total production of coal during the year 1919 was approximately 458,000,000 tons, this being the smallest output for any year since 1915. Compared with the 579,000,000 tons of the record year, 1918, this is a decrease of more than 121,000,000 tons. The shortage of coal cars reappeared as a significant factor limiting production during the weeks ending December 20, 1919, and was a consequence of the extraordinary traffic conditions resulting from the strike. Losses due to transportation disability were reported as amounting to 37.7 per cent in the Fairmont (W. Va.) district, 40.2 per cent in Summerset County (Pa.) and 30.3 per cent in the Cumberland-Piedmont (W. Va.) field. To meet the shortage of coal in the central field, it was necessary to ship the coal mined largely in West Virginia and Pennsylvania to the middle west and very little to points east of the Allegheny mountains. This abnormal movement has interfered with the prompt return of empties.

Thomas Dewitt Cuyler, chairman, and Alfred P. Phom, counsel, of the Association of Railway Executives, have presented a memorandum to the conference committee now engaged in an effort to reconcile the differences between the Esch and Cummins bills. This was designed to explain the position of the railway executives with regard to the provisions of these bills and particularly as to the rate-making clauses of the Cummins bill, which was opposed because of the restrictions placed on the earnings of the more prosperous roads.

A convention of the general chairmen of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers will be held in Los Angeles, Cal., on January 26, according to a recent announcement. The convention will consider the action to be taken in the event that the wage demands of the brotherhood are refused. Allen E. Barker, president of the brotherhood, stated recently that the officers of the brotherhood "would not allow" the return of the railroads to private control before a general wage increase of at least 25 per cent had been granted to the members of the organization and that failure to obtain the increase will mean a strike.

The Georgia Southern & Florida has two employees that have been with that road since its beginning, one a locomotive engineer, the other a section foreman, who have both made records worthy of emulation. In connection with this the Southern News Bulletin states that Section Foreman M. McCormack has been in the continuous service of the Georgia Southern & Florida since September 22, 1888, has never been reprimanded in any way since that date and is regarded as one of the best foremen on the road. He has won several prizes for the best section and has the further reputation of having always been ready within a few minutes after any call, night or day, to clear trouble on the line.

Director General Hines has appointed the following committees to arrange details connected with the transfer of the railroads to private operation March 1, and also to recommend the machinery necessary to liquidate the federal administration:

Liquidation Committee.—Chairman, John Barton Payne; Messrs. Powell, Sherley, Spencer, Underwood.

Committee on Claims.—Chairman, T. C. Powell; Messrs. Prouty, Tyler, Underwood.

Special Committee to Confer with Corporations in the Matter of Interest on Additions and Betterments.—Chairman, John Barton Payne; Messrs. Powell, Prouty, Sherley, Underwood, Parker.

The railroads under Federal control in November, 1919, handled an aggregate of 32,539,248,000 net ton miles of revenue and non-revenue freight, a decrease of 8.5 per cent as compared with November, 1918, as stated in the monthly report of the Operating Statistics section. Train miles decreased 3.9 per cent and total car miles 2.9 per cent. The net ton miles per train mile decreased from 686 to 653 and the net ton miles per loaded car mile from 29.5 to 26.2. The percentage of unserviceable freight cars was 6.3 as compared with 5.6. The car miles per car day averaged 23.3 as compared with 24.6 and the net ton miles per car day averaged 436 as compared with 488, a decrease of 10.7 per cent. For the eleven months ended November 30, the net ton miles aggregated 361,331,207,000, a decrease of 10.4 per cent.

The Wisconsin Railroad Commission's special grade-crossing engineer has been making a survey of the work before him, and determining upon a program for the year 1920. The Commission's card index record shows that there are about

9,500 grade crossings of railroads by highways. Of this number about 500 have been taken care of by flagmen or warning devices, and by the separation of grades. There remain then 9,000 grade-crossings, the majority of which may not be classed as dangerous. The Commission's plan, which is now being put in operation, is to eliminate from the list of dangerous crossings first those that are dangerous because of obstructed views, by banks, board fences, brush or trees. Then taking up in the order of the menace they present to highway travel proceed to carry out a plan for reducing danger to the minimum. As a means of warning automobile drivers of the dangers at grade crossings, an illustrated poster is being prepared by the Commission to be placed in railroad stations, hotels, garages, etc.

The Interstate Commerce Commission heard oral arguments on January 7 with regard to the question of final value to be determined with respect to certain railway properties. Briefs were presented by W. D. Brantley, Sanford Robinson and Leslie Craven for the President's Conference committee, P. J. Farrell, chief counsel of the Interstate Commerce Commission, and C. E. Elmquist and J. E. Benton for the Valuation committee of the National Association of Railway Utilities Commissioners. The contention of the representatives of the President's Conference committee was that the Interstate Commerce Commission must determine a definite figure as the valuation of each railway property, while those representing the utility commissioners expressed the idea that the commission should simply present data on the various elements of value.

The Material Handling Machinery Manufacturers' Association will hold an open convention at the Waldorf-Astoria hotel, New York, on February 26 and 27. The program includes a morning business session on the first day, followed by a formal luncheon with an address by a prominent speaker and an afternoon session, at which papers on mechanical handling will be read, followed by an open discussion and moving pictures. The second day will be an executive session followed by a continuation of the papers on mechanical handling and the moving picture program. This association has made considerable growth in the last year and now numbers 46 active members and six associate members. Calvin Tomkins is president and Z. W. Carter secretary, with headquarters at 35 West 39th street, New York.

The Southern Pacific on lines north of Ashland has been awarded a banner by R. H. Aishton, regional director of the Northwestern region, for obtaining the best results of those roads employing over 2,000 men in the Northwestern region during the recent national railroad accident prevention drive. Although employing 4,676 men and operating 1,222 miles of road, the Southern Pacific on this section had no reportable casualties during the entire period of the drive, while during the same two weeks of 1918 one employee was killed and 13 were injured. The banner for the second group, those employing less than 2,000 men, was awarded to the Chicago & Western Indiana, who had no reportable casualties to employees during the drive period as compared to four injuries during 1918. Honorable mention was also given to the Spokane, Portland & Seattle, employing 2,245 men; the Duluth, South Shore & Atlantic, employing 2,080, and to the Chicago, Milwaukee & St. Paul, employing 71,550 men, as a result of the exceptional records which these roads made during the drive.

New York Central employees are being interested in a plan to secure representation in the management and a share in the profits of railway operation without the assistance of such radical projects as the Plumb plan for government ownership. The movement was started in the grade separation department of the New York Central Western Lines by C. F. Mayer, engineer of grade separation, at Cleveland, who outlined a plan to the men whereby they could purchase stock outright or acquire it through a 10-payment method somewhat similar to the method by which Liberty bonds were purchased during the war. The plan was well received in his office, 10 of the 13 employees subscribing for stock, and is now being circulated through the other departments of the New York Central. Upon complete payment for the stock it is turned over to the individual, who thereby becomes a stockholder, and as such is entitled to a vote in the management of the corporation and an interest in the profits of the corporation. This system, according to Mr. Mayer, will result in a saving of money which in 9 cases out of 10 would not otherwise occur, with the attraction of a larger return on the money than that normally paid by a savings account. By purchasing stock at $75, or thereabouts, its present approximate market value, the individual will obtain (on the basis of present New York Central dividends) a 5 per cent return on the par value of the stock ($100), or approximately 7 per cent on the original investment of $75.

The Southern Pacific system of supply train operation has been made the subject of the first products of that company's complete plant for the making and presenting of motion pictures. According to the Southern Pacific Bulletin, this picture was recently displayed at the convention of railway storekeepers in Chicago and received the approval of the officers of the Stores Section of the United States Railroad Administration. The Bulletin states further that there are four supply trains operating monthly over 5,175 miles of main line and branch, delivering once a month approximately 6,000 tons of miscellaneous materials and supplies and collecting about 3,000 tons of scrap and secondhand material. The supply trains carry a small surplus stock of the more important items over and above requisition requirements and are thus able to fill requests for materials or supplies other than those called for on requisitions, to correct mistakes made on requisitions through incorrect descriptions, etc., to outfit newly organized extra gangs completely with tools, etc., thereby saving delay and expense, and to deliver such material as frogs, switches, etc., at points where they are to be installed. Under this system the division storekeeper and supply car storekeeper come in direct contact with the users of material and are in a position to accomplish considerable good through the elimination of unnecessary purchases, correspondence and return shipments. Superintendents usually accompany the supply train with their division engineer, roadmaster, signal supervisor, fire and watch inspectors, etc., who are thus able to cover their districts in a thoroughly and comparatively complete manner. An annual saving of well over $100,000 was obtained through the difference in cost between delivering material by local freight and by supply train.

Up to the end of October, 1919, this country had exported 568,065 tons of rails, valued at $36,348,148, which is more from the standpoint of quantity than has occurred in any full year from 1914 to 1918, with the exeption of 1917, when 594,389 tons were exported. However, from the standpoint of value, it far exceeds any of the previous years since 1914 and the indications are that the total for the full year of 1919 will approach an amount approximately double in value of that of the best preceding year. The exports of track spikes, switches, frogs, splice bars, etc., compare similarly both in quantity and value to the exports of steel rails. Considering the 1919 total for exports of track material alone, it is worth noting that the largest buyers for the year have been Japan, France and Cuba.

TABLE IV. EXPORTS OF RAILWAY TRACK MATERIAL

	Spikes		Rails		Switches frogs, splice bars, etc.
Month	Pounds	Dollars	Tons	Dollars	Dollars
January	3,509,054	189,468	65,024	4,221,563	543,330
February	4,206,228	258,073	66,900	6,023,982	905,264
March	4,185,816	193,987	48,955	3,051,611	515,535
April	7,799,630	413,292	60,463	3,416,590	1,063,437
May	6,642,827	437,392	76,134	4,902,970	1,881,626
June	9,727,943	484,466	67,028	4,208,872	1,359,725
July	3,803,927	209,054	32,707	1,870,583	289,232
August	4,009,107	216,154	48,700	2,768,558	538,914
September	4,298,046	179,197	58,424	3,403,771	473,753
October	2,899,162	130,941	43,730	2,479,648	533,246
Total for 10 mos.	51,081,740	2,711,964	568,065	36,348,148	8,104,062

Comparison With Previous Years (Entire 12 Months)

	Spikes		Rails		Switches frogs, splice bars, etc.
Year	Pounds	Dollars	Tons	Dollars	Dollars
1914	19,564,618	346,034	338,713	10,259,109	2,534,148
1915	12,289,203	203,663	159,587	4,537,978	2,407,490
1916	59,145,818	1,398,514	537,918	17,631,756	5,261,944
1917	42,809,961	1,502,430	594,389	25,405,469	9,108,617
1918	34,832,142	1,722,922	430,347	22,817,400	6,286,369

PERSONAL MENTION

GENERAL

Carl C. Witt, district engineer of the Western district of the Interstate Commerce Commission, with headquarters at Kansas City, Mo., has been appointed a member of the Engineering Board of the Division of Valuation of the Interstate Commerce Commission in charge of valuation work in the western district, with the same headquarters, in place of **J. S. Worley,** resigned.

Charles A. Prouty has resigned as director of the Division of Accounting of the Railroad Administration and has been appointed an advisory member of the director-general's staff, in which capacity he will give attention to the principal accounting problems of the Railroad Administration and particularly to the accounting features of maintenance questions which arise under the provision of the standard compensation contract. The work of the Division of Accounting is transferred to the office of the director-general and will be in charge of **G. H. Parker,** now financial assistant to the director-general, who will have the title of controller.

ENGINEERING

A. M. Davidson, assistant engineer on the Baltimore & Ohio, Western Lines, with headquarters at Cincinnati, Ohio, has been appointed assistant division engineer, with the same headquarters, in place of **L. A. Robenheiser,** transferred.

C. H. Koyl, engineer of water service on the Great Northern, with headquarters at St. Paul, Minn., has been appointed engineer of water service on the Chicago, Milwaukee & St. Paul, a newly created position, with offices at Chicago.

C. H. Judson, assistant valuation engineer of the New York Central, Lines West of Buffalo, at Cleveland, Ohio, has been promoted to assistant engineer in charge of work in connection with Valuation Order No. 3 for the lines west of Buffalo.

Lieutenant-Colonel B. Ripley, who went to France as commander of the first Canadian construction battalion, and had previously had charge of track elevation work for the Canadian Pacific at North Toronto, has been appointed district engineer of the Ontario district of the Canadian Pacific, with headquarters at Toronto, Ont., succeeding **A. L. Hertzberg,** who has retired.

W. C. Kline, engineer of construction of the Western Maryland, with headquarters at Baltimore, Md., has resigned to accept the position of chief engineer of the Monongahela Valley Traction Company, with headquarters at Fairmont, W. Va. Mr. Kline is a graduate of Lehigh University and entered railway service with the Pennsylvania Railroad in 1905 in the engineering department, working on East River Tunnel construction at New York. In 1908 he left this road to go to work for the Western Pacific in Nevada, changing later to the Southern Pacific, with which road he remained until 1910, when he joined the Western Maryland, serving successively as resident engineer, division engineer and engineer of construction until his recent resignation.

TRACK

O. C. Wilkes has been promoted to roadmaster on the Nebraska division of the Union Pacific, with headquarters at Grand Island, Neb., in place of W. J. Nickles.

Anton Amundson has been promoted to acting roadmaster on the second and fifth districts of the Winnipeg division of the Minneapolis, St. Paul & Sault Sainte Marie, with headquarters at Wishek, N. D., in place of **J. Shauer,** resigned.

John S. LaTronch, extra gang foreman on the Chicago, Milwaukee & St. Paul, has been promoted to roadmaster on the Prairie du Chien division, with headquarters at Madison, Wis., in place of **F. W. Sawtelle,** assigned to other duties. Mr. LaTronch was born at Harpers Ferry, Iowa, on June 28, 1866, and entered railway service in 1881 with the Chicago, Milwaukee & St. Paul. In 1901 he was made section foreman and in 1912 he was promoted to extra gang foreman, which position he held until his recent promotion.

H. M. Petry has been promoted to roadmaster on the Havre division of the Great Northern, covering the territory from Great Falls to Power, Gilman and Pendry, with headquarters at Great Falls, Mont., in place of **D. Deneen,** who has been transferred to the Great Falls district of the Havre division, with headquarters at Havre, Mont., succeeding **Martin Haley,** who has been transferred to the Breckenridge division, with headquarters at Fargo, N. D., vice **C. Holm,** resigned.

S. J. Harris, track supervisor on the Georgia, Southern & Florida, retired on a pension on October 1, after 43 years continuous service. Mr. Harris, who is now 59 years of age, entered railway service in 1876 as a water boy on the Southern's Macon-Brunswick line. Later he was promoted to extra gang foreman, which position he held until July, 1888, when he left this line to enter the service of the Georgia, Southern & Florida as consrturtion foreman in charge of a track surfacing gang while the road was being built. When the work was completed, he was transferred to the Macon & Birmingham, where he remained until that line was completed. He then returned to the Georgia, Southern & Florida and was promoted to track supervisor on June 10, 1890, which position he held until his retirement.

PURCHASING AND STORES

Tom Moore, general storekeeper of the Virginian, with headquarters at Princeton, W. Va., has been promoted to purchasing agent, with headquarters at Norfolk, Va., in place of **A. B. Lacy,** resigned, to become vice-president of M. T. Blassingham & Co., Inc., Norfolk, Va. **D. C. King** will succeed Mr. Moore as general storekeeper.

F. E. Johnson, storekeeper of the Baltimore & Ohio, with headquarters at Mt. Clare, Baltimore, Md., has been promoted to assistant general storekeeper at Baltimore; **H. Shoemaker,** district storekeeper of the Northwest District, with headquarters at Cleveland, Ohio, has been appointed Mr. Johnson's successor, and Mr. Shoemaker has been succeeded by **J. G. Calori.**

OBITUARY

C. F. Flint, foreman of bridges and buildings on the Central Vermont, with headquarters at St. Albans, Vt., died suddenly at Essex Junction, Vt., on November 17, 1919.

George Weston, consulting engineer, died at Philadelphia, Pa., on January 7, at the age of 58 years. Mr. Weston's early engineering experience was in railway service, entering the engineering department of the Missouri, Kansas & Texas and later becoming superintendent of construction with the Tennessee Central. In recent years he had much to do with the building and electrification of city and suburban lines in Chicago. In 1907 he was appointed by the city of Chicago to place a valuation on the properties of the traction lines and in 1908 was a member of the board of engineers. Mr. Weston was the author of "Industrial Democracy."

Edward Raymond, who entered railway service in the maintenance-of-way department of the Atchison, Topeka & Santa Fe and worked his way up to assistant general manager of the eastern district, with headquarters at Topeka, Kan., died in that city on January 13 at the age of 61 years. Mr. Raymond entered railway service as a section foreman on the Atchison, Topeka & Santa Fe in 1877, being promoted successively to roadmaster, trainmaster, assistant superintendent and division superintendent until in December, 1910, he was promoted to general superintendent of the western district of the eastern lines, with headquarters at Newton, Kan. In 1914 he was temporarily appointed assistant to the vice-president in charge of operation at Chicago, resuming his old status in 1915. In September, 1916, he was transferred as general superintendent of the eastern district, eastern lines, with headquarters at Topeka, being appointed assistant general manager of the eastern district in 1917, with the same duties. This position he held until his death.

CONSTRUCTION NEWS

The Atchison, Topeka & Santa Fe has been called upon to construct a subway at Chillicothe, Ill., the total cost of which has been estimated as $87,000, the largest portion of which will be borne by the railroad.

The Chicago, Rock Island & Pacific will build its own line into Wichita Falls, according to a recent announcement, and a survey from Waurika, Okla., to that city will be started shortly. As soon as the survey is finished and the right-of-way secured, construction will be commenced. The extension, which will be about 40 miles long, will give Wichita Falls and a big area a direct transportation outlet to important towns in Oklahoma. This road will also erect a brick and stucco station at Grandfield, Okla.

The Esquimalt & Nanaimo will commence clearing the right-of-way, grading and bridging work on a new branch from near Alberni to the Great Central Lake, a distance of about 10.5 miles. The Foundation Company of British Columbia, Ltd., Vancouver, will do the work.

The Fort Worth & Mineral Wells Railway Company is planning a line from Fort Worth to Mineral Wells, Tex., a distance of about 60 miles, and the Fort Worth, Mineral Wells & Breckenridge Railway Company, a line from Mineral Wells to Breckenridge, a distance of about 55 miles. H. E. Robinson of Fort Worth is president of both companies.

The Golden Belt Line, a railroad recently projected, will run through Barton, Rush and Ellis counties, Kansas, connecting the town of Hays with Great Bend and Hutchinson, Kan., with the northern part of the state, a total length of 52 miles.

The Gainesville-Sherman Traction Company will shortly be incorporated with a capital stock of $1,500,000 to build a line about 40 miles long from Gainesville east to Sherman, Tex., via Callisburg, Whitesboro, Sadler and Southmayd. It is also contemplated to build eventually in the opposite direction from Gainesville west to Montague, Tex., a distance of approximately 45 miles, via Lindsay, Myra, Muenster and Saint Jo. George M. Easley is to be president of the new Gainesville-Sherman Company.

The Kansas & Colorado will construct roads in southwestern Kansas, according to an announcement by O. P. Biers, president of the company.

The Pacific Great Western is considering the relocation of 15 miles of its line near the Cottonwood river, B. C., which has been subject to continual subsidence, requiring the extensive use of piles and trestles to maintain line and surface. The Cottonwood river crossing on the new location would require a bridge 400 ft. long as compared with the present one comprising 1,800 ft. of steel work and 1,200 ft. of trestle. The estimated cost of the relocation, a survey of which has been completed, is $500,000.

The Quebec Central has an extension of its line under survey from Scotts, Que., to a connection with the Canadian National, near St. Isadore, Que., a distance of about 8 miles.

The Ringling, Eastland & Gulf, formerly the Eastland, Wichita Falls & Gulf and recently purchased by John Ringling, has bought a considerable amount of standard 90-lb. rail. Track laying will commence as soon as the working crews can be organized. W. E. Brown, general manager of the Ringling railroads, including the Dayton, Toledo & Chicago and the Oklahoma, New Mexico & Pacific, has charge of the work, with C. H. Chamberlain chief engineer, both with headquarters at Eastland, Tex.

The Salt Lake & Denver is the name of a company organized to construct a railroad from Provo, Utah, to a connection with the Denver & Salt Lake at Craig, Colo., a distance of approximately 310 miles. Simon Bamberger is president of the company.

IRON STEEL

The Alaska Engineering Commission is inquiring in Chicago for 1,500 tons of steel for a bridge on the government railroad in Alaska.

The Atchison, Topeka & Santa Fe is expected to close soon for 70,000 tons of rails, two-thirds to be rolled by the Colorado mills and one-third at South Chicago.

The Canadian Pacific rail order placed with the Algoma mill has been increased from 80,000 to 140,000 tons.

The Chicago, Burlington & Quincy is inquiring for 1,000 tons of structural steel for bridges. This road recently placed rail orders in Chicago amounting to 55,000 tons, 35,000 tons of which went to the Illinois Steel Company, South Chicago, and 20,000 tons to the Colorado Fuel & Iron Co.

The Chicago, Milwaukee & St. Paul has made arrangements at western mills for 20,000 tons of rail.

France is making inquiries in this country for 600,000 steel ties.

The Great Northern is inquiring for 2,160 tons of structural steel for bridges.

A Japanese order for 44 track miles of 40-pound rails has been placed in the East for second quarter delivery.

Mitsui & Co., New York, are in the market for about 100 steel transmission towers calling for 6,000 tons of steel for one of the Japanese hydraulic electric companies, and are also inquiring for 3,000 tons of rails and accessories for use on the Siamese State Railways.

The Wheeling & Lake Erie has placed orders for 4,000 tons of rails with the Carnegie Steel Company, Pittsburgh.

EXPORTS OF RAILWAY TRACK MATERIAL IN NOVEMBER

The exports of steel rails, amounting to 54,342 tons, valued at $3,194,458, in November, were greater than those of October, but not as great as in September. The exports of spikes and switches, frogs, splice bars, etc., during the month were, on the other hand, among the lowest of the year. The detailed figures as compiled by the Division of Statistics of the Bureau of Foreign and Domestic Commerce are as follows:

EXPORTS OF RAILWAY TRACK MATERIAL IN NOVEMBER.

Countries	Spikes		Steel Rails		Switches, frogs, splice bars, etc.
	Pounds	Dollars	Tons	Dollars	Dollars
Belgium	.....	.....	515	32,648	.....
France	.....	.....	3,362	256,607	2,044
Netherlands	17,500	1,750	844	51,342	1,183
Norway	.....	.....	6	770	3,181
Portugal	5,454	412	69	4,424	.....
England	.....	.....	.....	.....	923
British Honduras	.....	.....	162	10,050	.....
Canada	8,915	477	535	25,802	43,083
Guatemala	18,100	849	.....	.....	.....
Honduras	16,000	833	505	26,769	2,369
Panama	.....	.....	25	1,274	1,155
Mexico	108,880	4,147	409	18,836	14,201
Jamaica	600	54	20	1,200	3,405
Trinidad and Tobago	.....	.....	3	225	398
Other British West Indies	8,960	385	.....	.....	466
Cuba	885,360	35,332	6,680	376,520	86,403
Danish West Indies	600	21	.....	.....	.....
French West Indies	8,774	752	.....	.....	657
Dominican Republic	32,000	1,175	149	10,561	1,257
Argentina	18,690	712	.....	.....	946
Bolivia	39,778	1,304	1,299	77,495	103,843
Chile	46,600	2,800	103	5,542	13,258
Colombia	.....	.....	156	10,278	844
Ecuador	19,675	859	.....	.....	4,161
British Guiana	.....	.....	445	21,762	30
Dutch Guiana	.....	.....	202	9,833	7
Peru	23,488	934	2,119	102,927	9,489
Venezuela	3,471	226	113	5,015	3,319
China	1,813	42	982	47,104	1,610
British India	.....	.....	352	22,099	2,739
Straits Settlements	2,310	58	35	2,101	2,487
Dutch East Indies	.....	.....	3,838	199,615	84,960
Hongkong	224,840	4,320	200	6,620	214
Japan	317,934	10,235	24,168	1,440,072	37,403
Siam	110,000	7,454	.....	.....	.....
Australia	.....	.....	.....	.....	437
New Zealand	.....	.....	50	3,300	479
Philippine Islands	88,081	11,631	3,243	173,651	20,611
British South Africa	335,850	26,169	3,753	250,016	7,593
Portuguese Africa	.....	.....	.....	.....	3,750
Total	2,343,673	112,921	54,342	3,194,458	507,756

SUPPLY TRADE NEWS

GENERAL

The Duntley-Dayton Company, Chicago, has changed its name to The Duntley Pneumatic Tool Company. There was no change in the officers of the company.

The William Graver Tank Works, Chicago, announces that it has changed its name to the Graver Corporation, although there will be no change in the management, ownership or directorate.

The Duff Jack Sales Company, Ltd., Oxford Circus House, 245 Oxford street, London, W. I., England, has been formed to represent the Duff Manufacturing Company, Pittsburgh, in the British Isles, and has been given the exclusive agency in this territory for Duff and Barrett jacks.

The Fairbanks Company, Chicago, has purchased practically the entire capital stock of the H. Channon Company, Chicago, and will enlarge the business of the latter company to include several new lines. A new organization has been formed, with **H. G. Elfborg,** formerly with the Ajax Forge Company, Chicago, as president.

The Joyce-Cridland Company, Dayton, Ohio, manufacturers of Joyce jacks, including hydraulic, railway, public service, ship-building, mining, and contractors' jacks, has recently opened a New York office for the convenience of the domestic and export trade, on the fifth floor of the Grand Central Palace, 45th street and Lexington avenue.

Stone & Webster, Boston, Mass., have admitted six new partners, all of whom have long been members of the organization. The new partners are: Frederick P. Royce, George O. Huhlfeld, Henry B. Sawyer, Frederick S. Pratt, Harry H. Hunt and Howard L. Rogers. The older members of the firm are Charles A. Stone, Edwin S. Webster, Russell Robb and Henry C. Bradlee.

F. C. Thornley & Co., Inc., constructing and consulting engineers, recently organized with temporary headquarters at 18 West Thirty-eighth street, has opened permanent offices at 31 West Forty-third street, New York. This company specializes in the design, construction, investigation and appraisal of mechanical labor saving systems, locomotive coaling stations, transfer terminals, distributing yards and industrial plants.

The Pittsburgh-Des Moines Steel Company, Des Moines, Ia., has commenced work on improvements at its Des Moines plant. These improvements, which consist of a new shop building, 135 ft. by 300 ft., equipped with traveling cranes and modern equipment for the fabrication of structural steel, will, when completed, cost more than $100,000. The building is expected to be complete and ready for operation by early spring and will give the Des Moines shop a 1,200 tons per month capacity.

The Reading Iron Company, Reading, Pa., has acquired the plant of the E. & C. Brooks Iron Company, Birdsboro, Pa. This property adds to the manufacturing equipment of the Reading Iron Company 16 double puddling furnaces, with a three-high double muck mill, a 24-inch three-high skelp mill with four heating furnaces, and a nail factory of 75 nail machines. Through the acquisition of the George B. Lessig Company plant at Pottstown, Pa., last October, the Reading Iron Company secured an additional muck bar capacity of 2,600 tons per month.

The Atlas Machinery & Supply Co. is now handling the sale of the American steam ash conveyor manufactured by the American Steam Conveyor Corporation, Chicago, in the St. Louis territory. The Atlas company has offices at 1416 Syndicate Trust building, St. Louis, Mo., and is a new sales organization in that vicinity. **William H. Patton,** who recently returned to the United States after two years' service in the army, is the head of this concern, and his brother, **W. R. Patton,** who for the past 20 years has been engaged in the sale of power plant equipment, is associated with him. **N. B. Stewart,** who has been identified with the power plant machinery business at St. Louis for 25 years, has also associated himself with this company.

S. F. Bowser & Company, Inc., have under consideration for the coming year extensive plans for expansion. The company plans the erection of a warehouse and office building at Dallas, Tex., and the organization of a subsidiary corporation to be known as **S. F. Bowser & Company** of Texas, for the sale of Bowser products throughout that state and adjacent territory. **E. P. Murray,** formerly assistant general sales manager, with headquarters at Chicago, will assume the management of the new company at Dallas. The offices at Denver, Colo., Memphis, Tenn., and St. Louis, Mo., which were closed during the war, will be re-established. **A. F. Bowser,** assistant to the treasurer, with headquarters at Fort Wayne, Ind., has been appointed manager of the Denver office. **B. L. Prince,** who has been district manager of the Dallas office, has been transferred to the Memphis office. **Willard D. Smith,** connected with the sales department, has been appointed manager of the St. Louis office. A new district office will be established at Detroit, Mich., and **L. E. Porter,** assistant district manager at Fort Wayne, Ind., has been appointed district manager of the new Detroit office.

BUSH, ROBERTS & SCHAEFER COMPANY

A new corporation, the Bush, Roberts & Schaefer Company, with offices in Chicago and New York, has been formed for the purpose of acting as engineers and contractors for general railroad construction work such as terminal facilities, reinforced concrete and steel bridges, viaducts and track elevation work.

The corporation was formed by Colonel Lincoln Bush, formerly chief engineer of the Delaware, Lackawanna & Western and more recently a consulting engineer with headquarters in New York City, together with the officers and directors of the Roberts & Schaefer Company, Chicago. However, the new company is not a subsidiary of the Roberts & Schaefer Company. The latter company will continue independently its operations, which have extended over a period of 16 years, in the building of locomotive coaling stations, cinder handling plants, material transfer plants and other storage and handling installations, whereas the new company will confine its operations to general railroad construction work. It is proposed also that the new company will undertake contracts for government, state, county or municipal work.

Colonel Bush, who becomes president of the Bush, Roberts & Schaefer Company, graduated from the University of Illinois in 1888. For notable engineering work the latter institution in 1904 conferred upon him the degree of Doctor of Engineering. He entered railway service in May, 1888, as assistant engineer, maintenance of way, of the Wyoming division of the Union Pacific, with headquarters at Cheyenne, Wyo. In July, 1889, he was appointed assistant engineer on location of the Pacific Short Line, with headquarters at Ogden, Utah, and continued in this position until January, 1890, when he became assistant instructor in descriptive geometry at the University of Illinois. In April, 1890, he became assistant engineer with E. L. Corthell in bridge work at Chicago, Ill. From December, 1891, to May, 1896, he was chief draftsman, designer and estimator in the western office of the Pittsburgh Bridge Company and from May to December of the latter year was draftsman in the bridge department of the Chicago Drainage Canal. In December, 1896, he returned to railway service as assistant to the bridge engineer of the Chicago & North Western, with offices in Chicago. In January, 1899, he was appointed acting division engineer of the Iowa division of the same road, with headquarters at Boone, Iowa, and in December of the same year was appointed bridge engineer of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J. In October, 1900, he was appointed principal assistant engineer of the same road and in February, 1903, chief engineer. In the latter capacity he discovered the sand jack for lowering great weights, such as the 1,000-ton double deck draw bridge at Newark, N. J., and in addition invented the Bush type of train shed and the Bush type of track construction. On January 1, 1909, he engaged in private practice as a consulting engineer and contractor with headquarters in New York

City. In this work he was engineer or consultant on the design and construction of 13 Bush train sheds and acted in an advisory capacity in several large railway construction projects in Pennsylvania. At this time Colonel Bush was also president and chief engineer of the Talbot Construction Company, vice-president and chief engineer of F. M. Talbot Company, and vice-president, treasurer and chief engineer of Flickwir & Bush, Inc. In October, 1917, Colonel Bush entered the service of the war department as a civilian and reached the grade of colonel in the Quartermaster Corps of the United States army on August 24, 1918. He was honorably discharged on March 31, 1919, since which time he has been engaged in private practice as a consulting engineer, with headquarters at 1 Madison avenue, New York City.

The present directors of Roberts & Schaefer Company, together with Colonel Bush, will be the officers and directors of the new company. Col. W. R. Roberts, president of Roberts & Schaefer, becomes chairman of the board of Bush, Roberts & Schaefer Company.

Col. Lincoln Bush

Col. W. R. Roberts

E. E. Barrett

J. J. Roberts

F. E. Mueller

C. P. Ross

Colonel Warren R. Roberts, president of Roberts & Schaefer Company, will hold the position of chairman of the board of directors of the new company; Edward E. Barrett, vice-president of Roberts & Schaefer Company, will be vice-president of the new organization; John J. Roberts, treasurer of Roberts & Schaefer Company, will be treasurer, and Frank E. Mueller, secretary and chief engineer of Roberts & Schaefer Company, will be secretary. The above, with Colonel Bush and Clyde P. Ross, contracting manager of Roberts & Schaefer Company, will constitute the board of directors of the new company.

Colonel Warren R. Roberts was graduated from the University of Illinois in 1888 and immediately entered the service of the Lassig Bridge Works, Chicago. He was later promoted to the position of chief draftsman of this company. During the years intervening between this period and 1894 he occupied different engineering positions in the city of Chicago. In 1894 he became assistant to the bridge engineer of the city of Chicago. In 1896 he was one of the incorporators of the H. M. R. Construction Company, Chicago, and in 1897 he entered construction work with two of his brothers. In 1904 Colonel Roberts, with J. V. Schaefer, John J. Roberts and Frank E. Mueller, formed a co-partnership known as Roberts, Schaefer & Company, to pursue the work of engineering and contracting in a specialty line of top works for coal mines. In September of the same year the corporation of Roberts & Schaefer Company was formed and Colonel Roberts was appointed president. In 1917 he entered the service of the War Department in the construction division of the United States army as a major and in the spring of 1918 was promoted to lieutenant-colonel. Soon after he was promoted to the rank of colonel. Since his discharge from the army, Colonel Roberts has returned to his duties as president of the Roberts & Schaefer Company.

Edward E. Barrett, vice-president of the Roberts & Schaefer Company and also vice-president of the new Bush, Roberts & Schaefer Company, was graduated from the University of Illinois in 1893 and for eight years after his graduation was in charge of hydrographic surveys and the construction of dams and levies on the Mississippi river under the direction of the United States Engineering Corps. During the year 1900 Mr. Barrett was assistant engineer on the Chicago, Burlington & Quincy, being identified with double tracking work in the state of Iowa. Later he became associated with Fairbanks, Morse & Company as civil engineer, handling the construction of locomotive coaling stations and other railroad structures. In 1904 he became associated

with Roberts & Schaefer Company, later becoming vice-president and director, which position he holds at the present time.

John J. Roberts, treasurer of the Roberts & Schaefer Company, and of the Bush, Roberts & Schaefer Company, received his education at the University of Illinois. In 1893 he entered construction work, acting in various capacities on bridge building construction and other projects until 1901.

At this time he was appointed chief estimator for Henry W. Schlueter Company, Chicago, and continued in that capacity until October, 1902, when he became assistant chief estimator of the George A. Fuller Company, with headquarters at New York City. At the time of the formation of the Roberts, Schaefer & Company, Mr. Roberts became one of the original co-partners. When that company was incorporated in September of the same year, Mr. Roberts became secretary and treasurer of the corporation. He relinquished the position of secretary in 1917, but has continued as treasurer of the corporation.

Frank E. Mueller, secretary of the Roberts & Schaefer Company and also secretary of the new corporation, graduated from Purdue University, Lafayette, Ind., in 1900, and in 1901 received a mechanical engineer's degree at that institution. In July, 1901, Mr. Mueller became associated with the Link Belt Machinery Company, Chicago, as a draftsman and after serving in that capacity for several months was promoted to assistant to J. V. Schaefer, who at that time was a salesman. In February, 1904, he left the Link Belt Machinery Company with Mr. Schaefer, who, with Colonel Warren R. Roberts, John J. Roberts and Mr. Mueller, formed the co-partnership of Roberts, Schaefer & Company. Mr. Mueller was appointed general superintendent of the new organization and in September, 1904, when the co-partnership was incorporated under the name of Roberts & Schaefer Company, he was appointed general superintendent and chief engineer. In addition Mr. Mueller was later appointed secretary and a director of the company.

Clyde P. Ross, contracting manager of the Roberts & Schaefer Company and a director of the new organization, graduated from the Chicago Manual Training School in 1898. He became connected with the engineering department of the Link Belt Company, Chicago, where he was engaged in the designing of coal washing plants, coal mining plants and various types of elevating and conveying machinery for the handling of coal. In March, 1904, when the Roberts, Schaefer & Company was organized, one of the original organizers, Mr. Schaefer, placed Mr. Ross in charge of design as chief draftsman. He held this position until 1907, when he was promoted to the position of principal assistant engineer. In 1909 he was elected a director of the Roberts & Schaefer Company.

PERSONAL

John W. Fogg, sales representative of the Boss Nut Company, Chicago, with offices at that city, has been promoted to railroad sales manager with the same headquarters.

E. A. Woodworth, secretary of the Committee on Mechanical Standards of the United States Railroad Administration, has resigned to become a special representative for the Chicago Pneumatic Tool Company, with office at Chicago.

Frederick T. Fearey, organizer of the Continuous Rail Joint Company, New York, and president of that company and its successor, the Rail Joint Company, until his retirement about two years ago, died on January 5 at his home in New York.

A. P. Van Schaick, special representative at Chicago of the American Chain Company, Inc., Bridgeport, Conn., was appointed assistant general sales manager of the company, with headquarters at the Grand Central Terminal, New York City, effective January 5.

James H. Grose, district manager of the Carnegie Steel Company, Pittsburgh, Pa., with headquarters at Youngstown, Pa., has been elected a member of the board of directors of the Brier Hill Steel Company, Youngstown, Ohio, succeeding **W. A. Thomas,** who has resigned, effective January 27, 1920. **I. Lamont Hughes** has been appointed to succeed Mr. Grose as district manager of the Carnegie Steel Company.

Harvey DeCamb, purchasing agent of the Gulf & Ship Island, the Mississippi Central and the New Orleans Great Northern, with offices at Hattiesburg, Miss., has been elected vice-president of the Certes Supply Company, St. Louis, Mo.

Hugo L. Siegel, former general sales manager of the Ford Roofing Products Company, has joined the Walter A. Zelnicker Supply Company as assistant to the president. **F. C. Reilly,** general freight agent of the St. Louis-San Francisco at St. Louis, Mo., has resigned to become vice-president of the Zelnicker company.

A. W. Ransome, manager of the New England territory of the Blaw-Knox Company, Pittsburgh, Pa., with offices at Boston, Mass., has been transferred to San Francisco, Cal., where he will serve as manager of the Pacific Coast territory, with offices in the Monadnock building, San Francisco. Mr. Ransome is succeeded in the Boston office by **O. A. Olstead,** who was formerly connected with the New York office of the Blaw-Knox Company.

R. B. Fisher, chief engineer of the Buda Company, Harvey, Ill., has been appointed general sales manager, directing all domestic and foreign sales and the advertising department. **Harry Miller,** assistant chief engineer, has been promoted to succeed Mr. Fisher as chief engineer. **W. C. Dyer,** superintendent at Harvey, has been elected president of the Buda Engine Service Company, with headquarters at New York, and **T. R. Mayeski,** chief clerk in the Chicago office of the Buda Company, has been promoted to assume a part of Mr. Dyer's former duties as superintendent. **W. P. Hunt, Jr.,** general sales manager and secretary, will continue as sales manager of the railway department and secretary of the company.

TRADE PUBLICATIONS

Thawing Torches.—The Aeroil Burner Company, Union Hill, N. J., has issued an eight-page folder illustrating the use of the Aeroil thawing torches, whereby burners supplied with fuel by a single tube from a pressure tank may be used to apply heat for thawing out switches, frogs, cars, etc.

Pipe Cutting and Threading Tools.—A new catalogue, No. 12, of Beaver cutting and threading tools for pipe has been published by the Borden Company, Warren, Ohio. It contains list prices and data for complete tools and extra parts and a large number of illustrations.

Concrete Tanks.—The Portland Cement Association has issued a 36-page bulletin illustrating and describing the use of concrete tanks for the storage of water, oil, acids and other purposes for which liquid containers are used. Among the data contained is a list of the industrial concerns having concrete tanks in use for various purposes, principally oil. Illustrations and brief descriptions are given on the use of concrete tanks for animal and mineral oils, brine, chemicals, etc., both for storage and for industrial processes.

Paasche Portable Painting Equipment.—The Paasche Air Brush Company, Chicago, has recently issued a four-page illustrated bulletin showing the various types of paint spraying equipment manufactured by this company. The bulletin contains specifications, sizes and prices of the different models ranging from hand power machines to auxiliary power equipment driven by gasoline and electric motors. The illustrations show the various styles in actual operation in painting exteriors and interiors of buildings, stacks and tanks, etc.

Lane Electric Crane—A new bulletin has recently been issued by N. B. Payne & Co., New York City, sole agent for Lane electric cranes manufactured by the Lane Manufacturing Company, Montpelier, Vt. The bulletin both illustrates and describes the several styles of electric cranes manufactured by this company in which steel girders or heavy timbers of long leaf yellow pine are used. It also contains a complete set of specifications and dimensions of the various styles and a long list of purchasers. A questionnaire has been inserted for the use of prospective purchasers on which all information necessary to the manufacture can be written.